

JOURNAL
OF
THE MILITARY SERVICE INSTITUTION
OF THE
UNITED STATES.

"I cannot help plead to my countrymen, at every opportunity, to cherish all that is manly and noble in the military profession, because Peace is enervating and no man is wise enough to foretell when soldiers may be in demand again."—SHERMAN.

VOL. XX.

MARCH, 1897.

NO. LXXXVI.

THE LYCEUM AT FORT AGAWAM.

BY CAPTAIN EBEN SWIFT, 5TH U. S. CAVALRY.

"Good lads, how do ye both?"

"As the indifferent children of the earth."

"On fortune's cap we are not the very button."

HAMLET.

A NATION devoted to the arts of peace cares little for the possession of an ideal army. Some motive or interest, more powerful than any that now appeals to the occupants of this hemisphere, is necessary. We envy no nation its wealth or limiting boundaries, we have no revenge to gratify, no creed to uphold, no allies to defend, and many of our wise men believe that anarchy may be exorcised by injunction. To raise a model army, with officers well trained in their art, we require new laws and appropriations of money for new uses, and a congress and a people deeply interested in its welfare. We need a prospective field of usefulness much nearer than anything now in view. These things we cannot expect.

But although this is true, it will never be accepted as an excuse for inefficiency in time of need. It is a fact that the country looks upon the army as a nucleus upon which to rally in the remote possibility of war; its officers are supposed to be a body of men trained in the profession of arms, fully able to undertake the organization, drill and instruction of new levies; any one of them would be likely to act as a staff officer, called upon

to apply the experience of past wars and to advise in all the intricate and minute details of a modern army. How pitiful that trust is most of us know full well. How to justify it is the object of this discussion.

Some armies have been improved only by defeat. In others the reaction after a successful war is often for the worse unless there is prospect of another war. Thirty years of peace frequently fixes many customs and traditions in an army that can only be uprooted by a new and terrible emergency. When that time comes we may be sure that other systems of peace training will be adopted, and that the new will only flourish if built upon the ruins of the old.

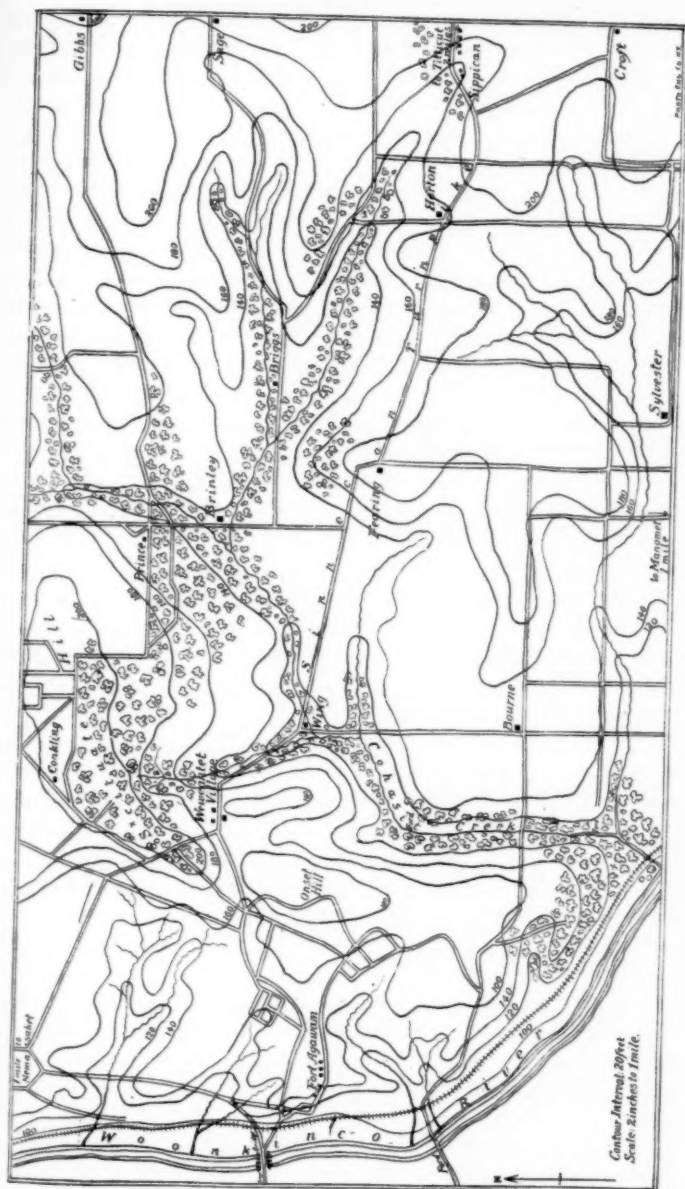
Criticism is not a pleasant task, but my thoughts are crowded with dreams of another day when I have imagined myself in a paradise for soldiers, where all things work smoothly to the single end of military proficiency, and all men seek "the bubble" without the vexing cares or weary routine of ordinary garrison life. To that blessed clime, where ignorance doth not enter and where tradition is a blank, I ask you now to follow me, over many leagues of space and time, to Fort Agawam on the borderland of our most distant possession.

Imagine the post garrisoned by a regiment of infantry, a squadron of cavalry, a battery of field artillery. Not far away a powerful neighbor had made many warlike preparations; a loyal population claimed protection; many believed that war was close at hand. Distance and difficulties of communication made it necessary to allow the Colonel to prepare his command in his own way for the coming emergency. He was a progressive man, with no failures in his past and a serene trust in the future. Under the heading of "The Lyceum at Fort Agawam" I will endeavor to outline all the methods introduced by him in the training of his officers without the presence of troops.

THE MAP.

Every day at an early hour the officers were assembled at the post headquarters, and on this occasion the Colonel rapped for silence and spoke as follows:—

Any satisfactory military study must be based on the possession of a map of some kind. The first thought would naturally be to use some of the numerous tactical studies published in other countries with maps of foreign ground. This plan is aban-



done after a careful examination. The best of those translated into English are too ambitious for our use, dealing like those of Moltke, Verdy, Gizycki and others with operations of armies and divisions. It is true that numerous copyists of these distinguished soldiers and writers have appeared who have not failed to discover the need for elementary studies on the same plan. Unfortunately, those that have appeared in English cannot be recommended. Some adopt an ideal terrain, involving numerous absurdities; others are so entirely foreign to anything we would accept in this country that they could not be considered; others propose problems but give no solution. It is above all essential that we make a study of our own conditions and apply them to our own ground. We will therefore begin our course of military instruction of officers by the preparation of a suitable map. It is not expected that we will get an elegant piece of topographical work or an entirely accurate survey. The idea is to produce a map in sufficient detail and on a large enough scale to show the tactical capabilities of the ground in the section in which we will begin our work.

We have now a small map on a scale of one-half inch to the mile, based on the Government survey. The map is fairly accurate on section lines, but not otherwise so. Some of the roads are not correctly shown, others do not appear at all. The limits of woods, farms and fences, the names of owners, etc., are entirely wanting, and there are no contours. We know the geographical position of the flag-staff, the variation of the compass, and the position of many of the monuments of the Government survey. This will furnish a sufficient framework for the map and a triangulation will not be necessary.

The country to be represented will be an area eight miles long and four and a half miles wide, at the east of the post. It will be divided into sections which will be bounded by natural lines as far as possible. An officer will be assigned to each section.

The plan to be followed will be for each officer to collect all available data within his section upon a skeleton map drawn to a scale of two inches to one mile. The necessary additional details will then be supplied by a gradual filling-in of the notes of special reconnaissances, omitting contours in the first instance. To put in the contours, several lines of accurate levels will be run throughout the district to be represented. The stations of

these lines will be bench-marks from which the officers will calculate the secondary levels with the hand-level. A single officer will be detailed to plat the completed notes on a "progress map" showing the entire district. If wide differences are discovered in connecting the surveys, the errors will be sought for and corrected.

The instrument to be used will be the "field sketching board," which is best described as a plane-table carried on the left forearm. It is of simple construction and can be made at the post.

After the work is finished a tracing will be made and blue-prints will be furnished to each officer and non-commissioned officer. An additional map will then be provided by enlarging the two-inch map to a scale of twelve inches to a mile for use in the midwinter exercises to be described hereafter.

It is not intended to prescribe here in detail the manner in which the officers will familiarize themselves with the field sketching board, as it is believed that the manuals are sufficiently explicit and that by confining themselves to the same piece of ground they will finally be able to work it up in satisfactory shape.

Without prescribing too minutely the details to be followed in making the map, I will only say that all roads and paths should be classified with reference to their use in a military sense. Thus macadamized roads should appear differently from country roads on which troops could not move so freely or on so broad a front; paths which will not accommodate wheeled vehicles should be shown differently from either.

Captains will not be available for this work. It will be performed by the lieutenants in a class under the direction of a field officer. We will have nearly one officer to each square mile of country, which is not a very heavy task, particularly when it is insisted that extra care in "finishing" is not desirable. A skilled surveyor would count on doing his share of this work in three days; unskilled but well-educated men should be able to do it in a little greater time.

This subject is placed after drill and before other work for many reasons beside the necessity of beginning with a good map. The making of sketches will be a part of all future exercises with troops so that the experience here gained may then be used each day. All map-work will be filed with a view to the constant improvement and correction of our "progress map." In future seasons the process of mapping in other directions will go

on and the area thus made available for our operations will be constantly extended.

The importance of military sketching is greater in this country than in other civilized countries where every foot of ground is well mapped. It gives valuable practice which can be utilized in reading and understanding all maps. It is a brief and graphic way of recording information. It forces you to give that minute study to ground which is necessary in handling troops.

METHODS OF INSTRUCTION.

The map was finished toward the end of September. The lyceum was to begin on October 15 and continue until April. About September 30th, the Colonel assembled the officers and spoke as follows :

With the beginning of the lyceum course a kind and quality of study that is new in our service will be inaugurated. We have now finished all the drills and theoretical studies called for by previous regulations, and you should be reasonably familiar with everything so taught and able to consult the proper references when you wish to refresh your memory on any point.

In the instruction of officers several methods have been recommended and employed. They differ so widely that a brief explanation of each will be given.

The first is called the "cramming" or "booking" system of study. It consists of daily recitations, or periodical examinations, or both recitations and examinations, on certain excellent text-books which are adopted as a standard. It results naturally that the test of proficiency is that of ability to answer questions taken from the books. A defect of the system is apparent when it is seen that a series of perfect daily recitations may be followed in a short time by a deficient examination. The knowledge so obtained is deceptive. It develops the memory and not the judgment. The false basis on which it rests may be shown in every trade and calling. From books you never learn to speak a language. To start the band to play, much more than a study of music is necessary. An officer weak at drill and instruction but brilliant in the book is one of our anomalies. Information so easily acquired oozes away as rapidly as it came, and the prime object of keeping in touch with your profession at all times is defeated.

A second method, which in truth is no method at all, may

be called a "pounding" system. It was the basis of the instruction of our volunteers during the Civil War. Without previous instruction and without knowing where to get it, they rushed into the field and learned their business by hard knocks and rough experience. This developed a magnificent army but it was expensive. It prolonged the war to four years, cost the Northern States five thousand millions of dollars, and gave a death-roll of more than a third of a million of their best and bravest men. What it cost the Southern States will never be known. An approval of the "pounding" method means a cessation of all military preparation and study in time of peace. It leaves the barn-door open and trusts to luck that the thief may be caught. It hopes to fool the God of Battles by talk of what Yankee Doodle has done in the past and what he will do again if he ever gets mad. It ignores the foreign sneer that we are a great nation only by sufferance.

The third method is called the "applicatory" system.

An examination of the other methods reveals to us the greatest difficulty that we encounter in military study. To bridge the chasm between practice and theory was long considered impracticable in our profession, although so easy in others. The error came from the mistaken idea that the only way to learn the methods of war was to practice war itself.

The "applicatory" method of teaching consists in working out tactical schemes which are based on probable or real military situations. Such situations are not hard to imagine and do not need the exciting incidents of war to make them useful for a military student. Having studied the theory we can apply it to various concrete cases and develop our ideas just as we would in practice. The whole process is greatly simplified when we are able to make our applications on familiar ground with the aid of a good map.

Much of the value of the system consists in the manner in which the case is presented, the care with which the books of reference are studied and consulted, and lastly in the number of cases that are considered. In the last point it partially resembles the second method where knowledge was gained by experience alone; the greater the experience the greater the knowledge gained. But here each experience is supplemented by discussion, criticism and study. In the course of time the variety of experience will be brought to resemble that obtained in a real

campaign. In a real campaign, you have not time to digest your experience, events follow each other too rapidly and your mind is diverted by things that shake the very temple of the soul. In a sham campaign these conditions do not exist, but they say that the habit of the manœuvre ground has often been found to take the place of courage in war.

THE LYCEUM COURSE.

The lyceum course of twenty-four weeks will be divided into three periods of eight weeks each. The first period is devoted to "written exercises," the second to map manœuvres, commonly called "kriegsspiel," and the third is devoted to studies of military history. One session in each week will be held and it is expected that the intervening time will be used in preparation. For this purpose ample notice of the character of future exercises will be given.

It will be found that some disadvantage is encountered from the absence of field service manuals. However, much that is essential will be found in the drill-books, in the pamphlet on Troops in Campaign and in the authorized text-books. The subject of orders is not sufficiently treated therein, and therefore it is deemed appropriate to give a full consideration to this important element of education.

THE ART OF COMMAND. ORDERS.

The whole fabric of the art of command rests on the issue of orders. It is not enough that a leader be self-reliant, experienced and brave; his subordinates loyal and skillful; his troops well-disciplined and filled with enthusiasm for their cause. All this was within reach of the greatest master of warfare that the world has known, but his best plans often failed or came near disaster. Napoleon excelled in clear and vigorous language, but something was wanting. His orders to Bernadotte previous to the battles of Jena and Auerstädt, to Berthier at the beginning of the Eckmühl campaign, to Ney at Dennewitz and Bautzen, to the marshals following up the victory of Dresden, to Grouchy at Ligny, can now be read in the light of history and of the statements of participants. Not all of his failures can be blamed upon subordinates whose instructions left no room for doubt; not all of his good fortune was due to a generous performance of his own well-expressed commands.

Nor can we seek for models in our own military history.

We have seen that Grant's repeated orders did not bring a division which was six miles away into the fight at Shiloh. The inactivity of Patterson in the Bull Run campaign was caused by the defective orders sent him. Hood explains the escape of a Federal army at Spring Hill by the fact that his orders to attack were not obeyed. The opportunity to destroy a portion of McClellan's army at Fair Oaks seems to have been missed because of the confused plans and orders of the Confederate commander. The great disaster at Chickamauga was caused by a badly worded order. Controversies on these subjects fill many pages of our records.

Strange ideas on the subject of military orders existed during the Civil War among officers who were supposed to represent the best trained element of our army. The orders at that time were often filled with useless details, ridiculous suggestions and unwarranted interference with subordinates.

The order for the advance of the Union army before the first Bull Run warned the army that three things were not pardonable in any commander. 1st. To come upon a battery or breastwork without a knowledge of its position. 2d. To be surprised. 3d. To fall back. This order, which directed a movement of over 35,000 men, prescribed that advanced guards, videttes and flankers were to be used. Brigades were told to sustain themselves as long as possible before asking help of others. The order gave directions as to manner of attacking a battery, and told how camp-kettles and mess-pans were to be carried.

The order of the Confederate commander for the attack on Grant's army at Pittsburg Landing required some hours for preparation, and now occupies about three pages of the Rebellion Records. It reminded one major-general, who, by the way, was himself the author of a system of tactics, that he must "make a proper distribution of the artillery along the line of battle, remembering that the rifle-guns are of long range, and should be placed in commanding positions in rear of his infantry, to fire mainly upon reserves and the second line of the enemy, but occasionally will be directed on his batteries and heads of columns." Another major-general, a veteran of twenty-five years service, was told how to form his regiments in line, but was permitted to place his artillery to suit himself, possibly in deference to the fact that his battery had saved the day at Buena Vista fourteen years before. The order provided for a number of detachments,

for camp guards, for repairs of bridges and roads, and closed with an appeal to the patriotism of the troops and enjoined them to obey orders, not to waste ammunition, to fire slowly, at a mark, and to do much work with the bayonet.

The will of a chief is conveyed to his subordinates in various ways. The higher his position, the more general in character will his orders be. At the beginning of operations, and from time to time thereafter, the plans and intentions of the supreme authority would be issued in the form of Letters of Instructions. They would regulate movements over a large area during a considerable time. In this way General Grant directed a million men over an area half as large as Europe, from his headquarters at City Point. His letters and telegrams were of the most general character and prescribed little else than the general objective of the hostile armies and concert of action in attacking them.

It seems appropriate that directions of the headquarters of an army marching on several roads, covering the dispositions for several days at a time, should be issued in the same way, although no uniform practice obtains. General Sherman's Orders, from the Headquarters of the Military Division of the Mississippi in his marches from Chattanooga to Atlanta and beyond, were almost too general to be called orders, although designated as such. Of the same character were the circulars issued by General Meade before the battle of Gettysburg.

As soon as it becomes necessary to prescribe matters of detail, orders are issued of a more precise form. They would, for instance, be issued to a command marching on a single road. It would be necessary to regulate the size of the different fractions of the command, the task of each, the sequence in which they take the road, and the hours of starting. It is to this kind of an order, to which I now ask your attention, because it will contain all the essential points of every field order.

Orders are general or special, for regimental and all larger commands; for small units or commands they are simply called orders. The commanders of the several fractions would use the terms Detachment Orders, Advance Guard Orders, Rear Guard Orders, depending on the character of the duty.

All orders, not directly concerned with the movement in hand, should be issued separately. The practice of mixing up orders for every conceivable detail in service with the order for the movement of troops was a common thing at one time in our

late war. Some of the orders of Chanzy in 1871 read like the army column of a newspaper. The written order is the rule particularly with large commands. Verbal orders should be written down when dictated to persons designated to receive them ;— when sent by messenger verbal orders should contain but a single well determined point.

Orders for a small command as well as those for a large command follow an invariable model. The idea is to group all information in such a way that the eye will catch the same thing at the same place always, and thus you lessen the danger of leaving something unprovided for. As soon as you have learned to issue orders with an absolute certainty of forgetting nothing, then you may dispense with forms or vary them to suit your fancy.

The usual form of an order is something as follows :—

The Caption. At the beginning is given the official designation of the leader's command, the place of issue, the date and often the hour and minute.

The date may be abbreviated in the usual way, thus, 11-20-95, indicating the eleventh month and twentieth day of the month of the year 1895. In naming a night mention both days, thus, Night 19/20 November. The hour and minute are written in railway fashion, thus, 9.15 A. M. The words noon and midnight should be written.

The kind of an order and its serial number are also stated.

The Body of the Order is divided into numbered paragraphs without headings :

I., contains information of the enemy and so much of the general situation as it would be desirable for the subordinates to know. The first might be given in some such way as this : " From reports received it seems probable that the enemy intends such a move," or " The enemy appears to be in such a position." This statement, to be of value, requires a complete system of reports, a free communication with all the fractions of a command, and an efficient service of information. From the fact that it was omitted from some of the most important orders of our last war we are led to the conclusion that scouting and reconnaissance were often defective, and also that the peculiar character of the theatre of operations made it impossible to locate the enemy until he was actually encountered. Even in such a case it would seem that the ideas of the commander, however vague they might be, would deserve a place in the order.

II., contains so much of the general plan as may be considered necessary for proper coöperation of all parts of the command. As an illustration of the necessity for these provisions I will refer you to the numerous cases where orders are based on incorrect notions of the position of the enemy, in which case the subordinate may be justified in disobeying the most positive order. One of the points of contention in the Fitz John Porter case was that the orders of General Pope were based on an erroneous idea of the enemy and the claim was made that the officer performed a great service in disobeying the order. At the battle of Wörth the orders of the Crown Prince, to break off the action, were disobeyed because the commanders on the field thought the fight had progressed too far to make such a thing advisable.

III., contains dispositions to be taken for carrying out the second paragraph, and the tasks assigned to each of the several fractions of the command. In an attack the most important dispositions would be given first, followed by others of minor importance; in a march we would begin with the most advanced troops, following with others on the order of their places on the road. To avoid the delay and confusion arising from a large number of troops arriving at one place of assembly, it is usual to designate an "initial point" or a place which a certain part of the column will leave at a designated time. The troops may then calculate the correct time when they will have to leave their camps to take their proper place in column.

IV., contains all necessary instructions about the train, care being taken to keep it where it will not interfere with troops or be involved in the confusion of battle.

V., gives the place of the commander or the place where reports should be sent.

The Margin should be ruled to include a half to one-third of the sheet of paper, and contain a statement of the component parts of the command, as well as its subdivision into fractions for protection, information or for various missions.

In naming bodies of troops ordinary abbreviations will be used. In naming units from which a portion is to be excluded the unit should be named and the word "less" appended (for instance, 1st Cavalry, less 1 squadron). If more than half the unit is detached, it is sufficient to name the troops concerned.

The Ending should give the name of the officer by whose

authority the order was issued. A statement is also appended to show how the order was communicated to the troops.

There is much to be avoided in an order; explanations, apologies and conjectures are a sign of weakness in a commander; interference with subordinates is unwise when they know their duties and have as good opportunities for seeing as yourself; make no provision for a retreat in an order for an advance; do not attempt to provide for events that may never occur and that no man can foresee; beware of all ambiguous forms of expression, such as the words "before," "behind," "forward," "rear," "this side," "that side," "right," "left," "great," "little." The compass bearing with reference to known points is the best way to designate a point that is not on your map. A road is given by the names of several of its prominent landmarks.

Let all responsibility be clearly placed or boldly assumed. Cultivate a plain style and short sentences.

MESSAGES, DISPATCHES, REPORTS.

A commander's knowledge of the situation is gained and his decisions are formed, largely by the messages he receives from the front. These messages are written on a message blank of size to fit, when once folded, an envelope furnished for the purpose. An inspection of the blank and envelope renders a description unnecessary, except to explain that the heading "Sending Detachment" should be filled in with the name of the body of troops with which the writer is on duty, as Picket of 1st Company 20th Regiment of Infantry, or Officers' patrol 6th Cavalry.

The address is written briefly as, "To General Sherman." The signature should be the writer's surname and rank.

For staff purposes copying apparatus is provided. It is usual not to completely close the envelope in order that commanders along the line of march may read its contents. The orderly retains the envelope.

I use the word "message" in preference to "report" which is generally employed in this country, so as to distinguish between brief communications which pass from one part to another of an army on service, and the more elaborate history of the operations prepared under cover, at greater leisure, giving a complete narrative of the campaign or battle. Hence it is more correct to say that a patrol sends a message than that it renders a report. A

dispatch is a brief narrative of events, more detailed than a message and less so than a report. It is usually sent immediately after any important events, to higher authority.

The message, in its brevity, clearness and freedom from official forms, resembles an order or a telegram. It may even contain an order when sent to a subordinate. The message may therefore take the place of reports from the front and of orders from the rear.

The utmost care should be observed in its preparation, remembering that *facts* are wanted and that they must be clearly separated from what is heard or surmised.

Our rebellion records are full of stories of overwhelming forces of the enemy, of uniform valor and victory on the side of the writer and of indiscriminate praise of subordinates. This tendency to magnify the size of the enemy, to call a defeat a victory, and to award praise where it is not justly due, is only natural but should be strongly repressed. The information thus obtained is valueless to a commander, and every willfully false report should be treated as a crime.

WRITTEN EXERCISES.

On the 15th of October the officers were again assembled and the Colonel opened the session with the following remarks :

Written exercises are solved indoors with the aid of a map and writing materials. The problem is either dictated or a copy will be given to each officer. For convenience the form of all solutions will be fixed by definite rules.

The questions will be simple and will require a study of the map and the usual conditions of service. They will be practically the questions that you would be called to solve in service, and would only lack the absorbing interest that would be given them when an officer's reputation, honor and life depend upon the proper answer. By dealing with them in this methodical way you will have an early experience of some of the difficulties you will encounter in war, and you will be able to form a habit of meeting them without doubt or dismay. A great soldier has confessed to us that it was not genius that revealed to him the sudden and unerring decisions that so often astonished the world ; it was long and patient study. So when you are given a problem let me advise you to read and reread it many times, until you find it well fixed in your mind, and then many of the snares and pitfalls will disappear.

This work will nearly always contain an issue of orders, the sending of messages and reports, and the reasons for all decisions. After this has been worked out for a given hour in the progress of some military operation, the time may be moved ahead to another hour of the day, when new conditions will be presented.

Military situations can be shown by tracings from the map, in which the positions of bodies of troops in various formations will appear. Thus the written exercise may take the form of a connected military movement, or a history of the phases of an imaginary campaign.

Recall if you please some of your experiences in tactical exercises with troops in the open. You have noticed that indecision and faulty dispositions were often the rule. You and others have felt all the sentiments of anger and despair of good soldiers put in false and unreal positions, which you have been powerless to improve and the true error of which you could not see. Of only one thing were you sure, and that was, that from the moment you left the drill ground you lost the indelible mark that should stamp the manoeuvres of regular troops. You noticed from the listless and indifferent manner of the men that they too were not deceived. They recognized at once the difficulties of their leaders, which were shown by vacillation, empty repetitions and undue deference to the advice of subordinates. Many officers feel that they have not gathered anything useful from these lessons, and they are too apt to accept the idea of those who laugh at it all and call it the "picnic" method of instruction. At the same time they feel like apologizing to the audience for their part in a military scheme where grim visaged war did smooth his ruffled front and sport in cap and motley. If any one here has had such an experience, I beg him to believe that it was due to lack of preparation and the right sort of study. If he had been given time and opportunity to work out all the details he would have reached a better result.

The written exercise is placed at the beginning of the lyceum course because it gives an abundance of time in which to work out the military questions involved; it excludes every matter which would tend to divert the untrained mind from this particular subject; it gives a chance to decide upon the best and clearest language; it gives an opportunity for full criticism and discussion. The written exercise is therefore an excellent pre-

liminary to the issue of verbal orders and the rendering of prompt and rapid decisions.

The first eight sessions of the lyceum course will then be devoted to a solution of eight problems. The chief point in each case will be to obtain a written order which would be the result of all the studies of the commander and would indicate the manner of execution of his task. In each problem the body of troops under consideration will be a detachment of all arms, consisting of the full garrison of this post with such special troops as may be required by the conditions of the problem. All units are at full war strength. In the first five problems the enemy will be supposed to be at a distance of one day's march; in the last three problems he will be supposed to be near. The time allowed for the solution will be four hours. A field officer will be assigned for criticism of each problem. On days for discussion there will be two sessions of the lyceum, one for the discussion and the other for the critique.

In a general way the problems will cover the following points:

1. A march in advance.
2. A march in retreat.
3. Establishment of an outpost by day.
4. Establishment of an outpost by night.
5. Camping of a command.
6. Dispositions for the attack of a position.
7. Dispositions for forcing the passage of a river.
8. Dispositions for the defense of a position.

WRITTEN EXERCISE NUMBER I.

Having given the foregoing instructions the Colonel proceeded to dictate the first problem. The problem and explanation as well as the criticism are here given in full.

He said:

The *problem* is a consideration of the marching orders of a detachment of all arms when the enemy is in front.

Situation: A Southern army is marching to the north by roads to the east of Titticut.

On the afternoon of to-day Col. A. of the Southern army is given command of a detachment camped at Titticut. His orders are to disable the railroad to-morrow by blowing up the culverts and bridges in the vicinity of Fort Agawam. He is informed that the Woonkinco River is fordable for all arms, that hostile

cavalry patrols have been seen to-day west of the river, and that infantry and artillery of the enemy are one day's march west of Fort Agawam.

His engineer officers inform him that the work of destruction will take three hours. The tools and explosives necessary must be carried in wagons, and can not keep up with cavalry.

The following named troops are placed under the orders of the Colonel:

26th Regiment of Infantry.

1 squadron of 11th Cavalry.

1 battery 6th Regiment Field Artillery.

$\frac{1}{2}$ company of Engineers.

Detachment of hospital corps.

The outposts at Titticut are provided by other troops.

Imagine yourself in the place of Colonel A.

In issuing orders for this command many things must be considered by the Colonel. To make the task more easy, I will enumerate them in nearly the same sequence that they would be presented to his mind. This will assist you to arrange and formulate your ideas before you write out your order. In answering the questions it is desirable that the reason for each decision be given, and where several alternatives are presented, the reasons for your choice should appear. We thus have seventeen questions, as follows:

1. How much of the information and instructions you have received will you communicate to your subordinates?
2. How much of your plans will you communicate to your subordinates?
3. How will you employ your cavalry, attached to your advance-guard, or independent of your advance-guard?
4. Will you specify the duties of the several fractions of your command? How much freedom of action is allowed your subordinates?
5. Will you march on one or on several roads?
6. What hour of starting do you propose?
7. What dispositions will be made of your train?
8. What measures will you take to protect the train?
9. What position will you assign to yourself?
10. How would you communicate this order to the troops?
11. What proportion of your force will you assign to your advance-guard?

12. What distances will you prescribe?
13. Will you designate a commander for the main body?
14. Are any dispositions necessary for guarding the flank?
15. What position do you assign the following troops: Engineers? Hospital Corps? Artillery?
16. Is a rear guard necessary?
17. Write out the complete orders of Colonel A. at Titticut.

It will be observed that sixteen of these questions are an elaboration of the points to be considered in the answer of the last and that the seventeenth answer is really the sum of the ideas brought out by the other sixteen questions.

The criticism at the next meeting was as follows:

In discussing this problem the last question will be answered first. Colonel A. would issue the following order:

DETACHMENT OF 1 BRIGADE 1 ARMY CORPS.

CAMP AT TITTICUT, 9-15-90. 1 P. M.

Detachment orders }
Number 1. }

Distribution of troops 9-16-90.

1. Advance Cavalry. (Major C.) 1 Sq. 11 U. S. Cav. less 1 plat.
2. Advance Guard. (Major B.) $\frac{1}{2}$ plat. 1 Sq. 11 U. S. Cav. 1 Bat. 26 U. S. Inf. $\frac{1}{2}$ Co. Engineers.
3. Main Body, and order of march, at 800 yards. $\frac{1}{2}$ plat. 1 Sq. 11 U. S. Cav.
- II. Bat. 26 U. S. Inf. 1 Batt'y 6 reg't U. S. Field Art.
- III. Bat. 26 U. S. Inf. Detachment of Bearer Co.
4. Train. $\frac{1}{2}$ plat 1 Sq. 11 U. S. Cav.

I. Cavalry patrols of the enemy have been seen west of the Woonkinco. His infantry and artillery are reported one day's march west of Fort Agawam.

II. The detachment will march to-morrow toward Fort Agawam by the road Sippican-Fearing's-Wing's

III. a. The cavalry will move at 5:30 A. M. to-morrow, and will cover the movement. It will seize the crossings of the Woonkinco and send patrols beyond.

b. The main body will march at 6 A. M. from the western exit of Titticut.

IV. The train will follow as far as Fearing's escorted by a fourth of a platoon.

V. I will be with the main body until 7 A.M. and with the advance guard after that.

A.

Colonel 26 Infantry.

Commanding.

Dictated to superior officers and staff.
Copy to Division Commander.

The explanation of this order may now be found in a discussion of the various points proposed.

1. The information of the enemy may be communicated in the identical words of the problem, but ordinarily a large number of reports would have been received, some widely conflicting, others vague and improbable. Your first duty is to sift these statements and to formulate one which shall be so brief, so plain and so well-substantiated as to give a clear idea of the strength, position and intentions of the enemy. This constitutes the first paragraph of the order. From it you may deduce that the enemy is marching on Fort Agawam because his cavalry is between us and his main body; that they are in considerable force is shown by his having artillery with his infantry; that he will not march on Fort Agawam before to-morrow, you conclude from the time and distance and the absence of good camps west of the river.

As to the special instructions you have received, it is better to keep them out of the written order, although good reasons can be given for either method. The general rule is to communicate so much as may enable your subordinates to carry out the operations in hand. In this case you may simply give a general direction to the march and thus discount the effect of any failure or change of plans. Nevertheless, Colonel A. may consult with the engineer officer in regard to the special work of his detachment, and with the cavalry commander with regard to the distance and extent of his operations which would be beyond immediate supervision. Otherwise, none need be informed of your instructions, except the staff. It has been suggested to explain it all to the second in command, but that officer would be bound to carry out the instructions and plans of the original commander if he should fall suddenly in command, and all necessary information on these points could be obtained from the staff. Although the problem points out the single objective of the railroad, it may be that the Colonel has instructions giving several alternatives and detailing his movements for several days. These things should manifestly be kept to himself.

2. It is a mistake to give any detailed statement of your plans for operating at the railroad itself. This takes into account matters that can only be settled when you arrive on the ground. In most cases your best formed plans will be modified, and you can not even count on reaching the river without an engagement.

To attempt to prescribe beforehand what the troops will do at a certain time is looking too far into the future and it is therefore commencing at the wrong end of the problem.

3. Regarding the use of the cavalry, it may be stated in general terms that as many cavalry as possible should be used. Under this rule all of our cavalry should be on the side toward the enemy whenever the ground admits of its use. It is easy to imagine a case where cavalry could be placed in rear of your column, as in a mountainous country. In mountainous country where you expect to enter an open country very soon, a part of the cavalry might be at the rear of the infantry of the advance guard. We have here a comparatively open country where it may be used as a part of the advance guard, or where it may be made independent of that body. There are strong reasons for both. If you had a relatively weak force of cavalry, you could not give it much independence of action. If you expect an engagement each moment, you would not care to send it far away. Here you have a very good sized force and I think you would use it independently for the following reasons:—it should not be tied to the infantry because its rate of march is faster and it would gain considerably in a march of this length; if you give the cavalry to the advance guard commander, that officer would be inclined to use it in the restricted service of securing the safety of the column, and not in the broader and more appropriate duty of reconnaissance; when the independent cavalry meets the hostile cavalry, it can manoeuvre so as to engage the latter to the best advantage because neither the direction of its advance nor of its retreat are obligatory. For instance, suppose a squadron of the enemy should appear in the direction of Manomet, he would be free to concentrate and attack them, while in the opposite case, he could not notice them. The cavalry commander gets his orders direct from Colonel A. without having them filtered through the minds of intermediate commanders. The advance guard commander knows that he must take measures for the protection of the column, independent of the cavalry, and is thus thrown on his mettle at all times.

A small detachment is, however, made from the cavalry for various purposes. These details should be confined to the smallest limits in order to save the cavalry from one of the worst abuses. The following would be sufficient; for maintaining order in the train, six men and a non-commissioned officer; for the

point of the advanced guard, one officer, one non-commissioned officer and six men; as orderlies, one non-commissioned officer and ten men; total, one platoon.

4. By "fractions of the command" is meant the advance cavalry, the main body and the train.

This question is simply an amplification of the second. It is only necessary to give them a proper direction at the beginning, and to wait for developments before giving subsequent orders. The road is described explicitly and the cavalry which is somewhat out of hand is limited in its movement. An hour for the march of the main body, and the point at which the head of the main body starts, are to enable each officer to know when his command must leave his camp or bivouac to reach his proper place in column at the right moment.

In the distribution of troops, the commanders of advance guard and cavalry are not told how to march their commands. The order of march of the main body is prescribed because it is considered to be under the command of the Colonel. All details are left to the subordinate commanders.

5. You should use the best road, even if it is a trifle longer. On the turnpike you might march in column of fours, while on side roads you would probably be limited to a column of twos. The high-road will usually be in better repair; on country roads you will be more likely to encounter bad places which will delay your march.

In most cases it was correctly decided to move by a single road because the reasons for using a number of roads would not apply to such a short column as this.

6. In work of this kind it should be borne in mind that ordinary exertions of troops should be considered. In the usual course of events the command would have reached Titticut after a day's march. They should not be expected to march before the next morning. I consider that the proposition to make a night march is an exceptional and unsafe proposition. The subject of night marches and night attacks is a study by itself. A night march is not considered to be an easy operation. The best authorities say that it will take half as long again as a march by day.

The time of starting is fixed at 6 A. M. when it is broad daylight.

7. Out of about a dozen answers that might be made, four

deserve special consideration. The train might follow the main body; it might move with the trains of the army toward the North; it might remain at Titticut; it might follow to a certain point and stop there and await orders.

The last solution is accepted notwithstanding many good reasons advanced in favor of some of the other propositions. The train is here ordered to Fearing's, where it may be held at the cross-roads, ready to march in any direction. It is near enough to receive orders quickly. It will not be in your way if you are defeated. It can join you easily at your camp for the night. Its position points to a general principle for the disposition of a large train.

8. This small train needs no large guard. A detail of eight troopers and a non-commissioned officer would in my opinion be sufficient to keep order in the train and to protect it from any small enterprises of the enemy.

9. Under modern conditions the commander rides far to the front. In this the practice has changed during late wars. His object in going to the front is not to interfere with the commander of the advance guard, but rather to form his estimate of the situation; to make his plans in good time and to send his orders to the rear. He would not, however, ride with the advance cavalry as several have suggested. It is not necessary that he should start out with the advance guard. It would be better for him to remain at Titticut until all the troops have left. It is a good idea for a commander to see his command march by him each day, after the manner of an informal review. For these reasons, the fifth paragraph is given the form you see here.

10. The order would be issued either verbally or in writing. The difficulty of providing a large number of copies on short notice makes the latter method of little use. It is usual to dictate the order to representatives from the several subdivisions of the command. I say here "dictated to superior officers," meaning the squadron commander, the advance guard commander, and the commanders of each part of the main body. A copy of the order should be sent to higher authority when it involves the carrying out of orders previously received from that source.

11. An important consideration is to preserve the integrity of the tactical units as far as possible. On this account we would select a battalion of infantry as an advance guard, even if it be a trifle too large or too small. Hence, I would never commend an

advance guard of three companies in any command that I can imagine.

12. It is considered that each officer will regulate his distances for himself according to circumstances. In the case before us, however, the Colonel himself directs the main body and gives it an hour for starting. Although it is strictly a part of the duty of the advance guard to take its proper position, it is not unusual to prescribe the distance at which it would precede the main body.

It is hard to say between what limits that distance would be right. In this case you may expect to meet the enemy soon; the country is full of defensive positions where a small force could delay you long, or the reverse. I think the distances should be a little greater than usual to prevent small checks in the advance guard being communicated to the main column. If the main body is eight hundred yards in rear of the advance guard, an order could be sent to the rear and the artillery could be brought up at a trot in ten minutes, or the leading companies of the main body could be brought up in about the same time. These considerations have led to the use of that distance for this particular case.

13. This question is referred to in several others. It is thought better for the commander himself to take command of the main body. He might notify the senior officer of that column when he goes to the front, but the designation of a special commander in this order would involve the issue of an order by the officer so designated. The duties of that officer would be nominal, as the main body must be considered as a special reserve under the direct orders of the chief. I do not believe it necessary to create a new office in the channel of communication between himself and the troops. The officer at the head of the main body may regulate the pace, order halts and rests, but all his independence will cease as soon as he has reported on the field.

14. The cavalry screen will probably provide sufficiently for this. Although there are several parallel roads a command of this size could protect its flanks better by keeping together than by making detachments.

15. Engineers would go with the advance-guard so they may get to work at an early moment; hospital troops are generally assigned to the rear of the main body. They would only be assigned to a large advance-guard in expectation of an action. Ar-

tillery are placed between the battalions of the main body. In country such as this, the greatest precaution to secure the safety of the artillery must be taken. There are many positions affording perfect cover for the enemy's infantry along the line of march and the opportunities for the use of artillery are very few until you reach the valley of Cohasit Creek. If the enemy is encountered, it is better to engage him at a distance than to place the artillery in danger from his skirmishers.

16. Generally speaking, when you begin to calculate your distances and find how great they are in comparison with the length of your main column, the question naturally occurs to you whether this was a case in which one of the subdivisions of the advance guard might be dispensed with. It would be right to do so if it were evident that the safety of the main body could be assured while doing so. As you decrease the size of your advance guard, you will sooner or later reach a point when this must be done. In my opinion, the safety of this command would be even better secured by leaving out the reserve of the advance guard, still this is a matter for the advance guard commander to decide, so it is left out of this order.

Likewise, there is the question as to the necessity for a rear guard. In a forward march the duties of a rear guard are insignificant, and as we have disposed of the train by halting it at Fearing's, I think the rear of the column could protect itself without a special body of troops for that purpose.

It is not sufficient to state that the command will start at a certain hour. The troops would be in bivouacs at some distance apart, and if all march at the same time, a part would be too soon and others would be too late to take their places at the proper time. For this reason an initial point is taken from which all calculations may be made. In this case, it is the western edge of Titticut, a point selected in advance of the bivouacs, which the head of the main body is expected to pass at a designated hour.

A number of solutions give directions about the amount of ammunition, forage and rations to be carried. These items occupied a large portion of the orders during our Civil War. In a well-regulated command, they do not deserve a place in orders for the operations of troops any more than a direction to carry their rifles and carbines.

It is well not to worry about the logic of the situation here given or to seek for difficulties outside the map. Whatever faults

might be discovered, your military duty would remain the same, that is to carry out your orders precisely as they are given to you. A habit of deciding what others should do instead of thinking about what you should be doing yourself has brought disaster to many a good man.

MAP MANCEUVRES OR KRIEGSSPIEL.

These exercises were introduced in the following way :

The idea of human strife has long been fascinating to mankind. It is the basis of all of our games of chance and skill,—the most ancient of which like chess and checkers, seem clearly to have been devised with the idea of representing opposing forces in combat, and under old conditions the game idea showed this quite well. In the darkness of the Middle Ages, war was one of the lost arts, but in a century of our high civilization a Frederic, a Napoleon, and a Moltke have appeared before the world, each as an expounder of a system of warfare that was superior to the last. It was natural then that soldiers should turn to the game in seeking to solve the new and complex questions presented by the leading of troops in war. To this we owe the Kriegsspiel or War Game of the Germans,—one of the potent aids to which is ascribed the tactical skill of all officers in the army of the conquerors of Denmark, Austria and France.

Following out the idea of a game, to show the operations of war, we would conduct the exercise upon a map of large scale, with small blocks to represent troops, a chief to command each side and an umpire to direct the whole.

It is evident that the map should present a fairly accurate picture of the ground, that the size of the blocks should bear a proper relation to the map, that the leaders should have a knowledge of drill and tactics and that an exceedingly difficult task is imposed on the umpire. Such a game is certainly capable of an infinite development and may test human intelligence to its limit.

Upon the umpire much depends. He must steer both leaders away from all absurdities; his decisions must be so luminous as to be approved at once by the judgment of his audience, and his heart must be closed to many fair and plausible excuses. He must insist on the rule that his decisions are to be accepted as infallible,—however many flaws and inconsistencies may have been discovered by the united observation of his critics.

To get a good umpire we have a choice of one of two

methods. The first is to obtain the services of one whose experience makes him able to pass upon every circumstance of actual war. This appears at first sight to be the only logical method but upon examination it will be found to be fallacious. There are very few men with such qualifications, but if we should happen to find one we would probably soon discover him to be an exponent of a number of prejudices due to his own observation or arm of the service or habits of thought. Upon intimate acquaintance with such a man we would find him to be an encyclopedia of rules for his own little game of war, which would differ in many points from the game of another expert of equal experience.

Our second and last recourse is to collect the results of all experience as a basis upon which to predict the course of future events under similar conditions. This requires that a great mass of facts be analyzed, sifted, tabulated and arranged in such a way that a man of limited experience can find from the tables in a minute the probable result of any series of circumstances. The tables then serve the part of an automatic umpire, and, of course, the value of the system will depend upon the care and intelligence with which the tables have been made. Some will claim that a fairly accurate result is not possible in this way but you will find that the method can be applied to well-known conditions in the Chilian war of 1891 and the Chino-Japanese war of last year, with surprising accuracy.

By both methods of umpiring therefore we have arrived at a result determined by experience. We have travelled by different roads, and if the last is not the best, it is at all events the only one available to us. It requires that each community shall possess at least one man having leisure, devotion and intelligence enough to fit himself for the position of umpire by studying the methods and application of the game. This does not seem to be a difficult matter, but it has proved to be so.

The game of war reduced to a book of tables and rules is one of the most complex affairs. Seventy years of patient work by many brilliant minds has indeed produced a beautiful system, and it is pleasant to think that many of its most delicate refinements have been worked out in our country by American officers. Nevertheless, I regret to say that the game is still laborious, slow and only satisfactory after long study and practice. Few officers are willing to accept the duty of an umpire even

under the apparently easy conditions of having their decisions already worked out for them. To make it popular and to make it possible as a factor in the training of every officer we must make it easier, for if its difficulties are great enough to discourage most men, they will make it useless for our purposes. If it cannot be applied at once, here and elsewhere, without long and devoted study, great experience in war and other exceptional advantages, then surely we must look for some other means of instruction.

It is probable that too much has been claimed for *Kriegspiel* and that its best application is in connection with other forms of instruction. By accepting this view, it is easy to make it more simple, both in the manner of playing the game and in the methods to be sought.

It is proposed to discard the idea of a game, in which the object is to show all the conditions of an actual campaign or battle, and to make it a simple exercise in the manoeuvring of troops, and in making verbal orders, messages and reports. When you do this, you eliminate all that is difficult or unreal and you silence the most violent critics. The questions of hostile contact and the computation of losses in action have usually been the greatest stumbling-blocks. All this is to be brushed aside in our lyceum course, not because of the criticism but because the exercise has abundant capacities for usefulness as an elementary study without it. At the same time it should not be denied that the advanced form will possess many points of interest to those who are willing to give it the time. As indicated above, it does not seem as if any startling results are to be expected from a use of smokeless powder and new weapons.

The next question is how to make the exercise profitable after we have partially eliminated the tables of losses from fire, the effects of hand-to-hand combat and the results of defeat or victory. There will still be isolated combats and minor questions of hostile contact to be settled in a general way by the umpire, who will, however, make no attempt to arrive at the exact numbers of killed and wounded. Whether or not opposing forces may advance or retreat can be quickly settled by an examination of the formation and numbers of the troops engaged and a study of the ground. As soon as contact has become sufficiently pronounced to cause a general engagement the exercise should be brought to an end.

The place to be assigned to Kriegsspiel in our course of instruction has already been indicated in remarks about written exercises. At that time you gave your entire attention to the issue of written orders, messages and reports. Ample time was then given and you were made familiar with forms and verbiage to be used. Now we go one step further and make this an exercise in making verbal orders and verbal reports. After the exercise is fairly under way all writing will be excluded. Now you will use a verbal form similar to the written forms which you have mastered. You will be constantly called on to answer questions which will require a knowledge of the capabilities of the arms of the service, an understanding of the military situation and an ability to give brief and clear decisions.

Let any man try this without previous practice. He will probably betray a hesitation which will at once be communicated to his subordinates, he will contradict himself, leave important points undecided, ask advice of those whose business is solely to obey. These are great faults in one who aspires to be a leader of men. Few indeed are those who become great in emergencies, with brains that are quickened by danger and inspired by difficulties. The ordinary man learns by a slower but generally surer method.

The books tell us many things that are a result of many centuries of human experience in warfare. If a Cheyenne Indian, a Cossack of the Don and one of Hannibal's Numidians could be gathered together here and told to ride down yonder valley and up to the crest of that hill looking for an enemy, they would probably follow nearly the same route. But a parade-ground soldier, who has never tested the axioms that guide men who have been warriors from immemorial tradition, would hesitate and blunder at each step. His books may have pointed out the true way, but not so that the reason approved or suggested nothing better. Principles are thus learned by the practice of details; operations of minor warfare such as the passage of defiles and bridges, the reconnaissance of villages and woods, and other things are verified in the relations of time and space; and thus we are led to an understanding of the great principle that "*Theory is but the law of facts.*"

I will save time by acknowledging all the common criticisms of Kriegsspiel. For its defects I do not apologize, but my claims for it I will state as follows:

1. It supplements previous exercises by practice in map reading.
2. It has an advantage over manœuvres in presenting the whole situation to your eye instead of a limited view.
3. It gives practice in issuing orders as well as in interpreting and executing them. It gives similar practice in messages and reports.
4. It gives practice in forming prompt and rapid decisions.
5. It gives practice in showing the principles of tactics and their application. In this way it is a most useful adjunct in the study of military history.
6. In the application of principles, it carries out in a few hours operations that would ordinarily consume many days.

This gives an abundant scope for *Kriegsspiel* in our scheme of post training. Within this limited field and with a free confession that merely a portion of your art is here to be learned, I commend the exercise to your attention.

We will use it now as a preliminary to the practice of manœuvres in the open.

The problems proposed will usually be such as can be subsequently worked out in the field with the troops, thereby giving you the advantage of an earlier study of the ground and of the various situations that are likely to arise.

In addition to a map we will need apparatus to show the troops. The excessive cost of the *Kriegsspiel* outfit is prohibitory, but I believe a good substitute could be found in the colored patent-leathers such as we use for trimming our saddle cloths. Small bits of this leather, in colors to show the opposing troops of different arms are therefore provided. The variety of blocks should be small and simple, and their greatest dimensions should be made to the scale of the map. Thus a troop of cavalry, occupying one hundred yards in line or column of fours, would occupy about three-fourths of an inch on the map. The troops are represented in their normal state, unbroken by fatigue, and undisturbed by the many incidents of service which *Kriegsspiel* endeavors to show by its numerous devices. It is essential to know the marching powers of troops of the different arms. For the sake of uniformity in deciding these points it is well to construct a table giving the rate of march of each arm, both under normal conditions and under modifications caused by sloping ground, ploughed ground, vegetation, mud and the like. Having this

apparatus at hand, let us show briefly how we could proceed with an exercise.

The officers detailed to work out a problem are divided into two opposing groups, each group with a commander. They are notified several days in advance. We will call an Eastern force Blue and a Western force Red.

To these officers the umpire issues a statement of the general situation, which embodies so much information as may be supposed to be possessed by both sides. It might be as follows:

General Situation.

A Western army, concentrating behind the Woonkinco River, has a detachment holding the bridge at Fort Agawam. An Eastern force is known to be at Titticut with a larger force ten miles in rear.

Special Situation. Blue.

The army will commence to cross to the east bank in a few days. To cover its crossing as well as to get timely notice of any movements of the enemy, Colonel A. will be sent to-morrow with a detachment to clear up the situation in the direction of Sippican.

Colonel A.'s force is as follows:

1 regiment of infantry.

1 squadron of cavalry.

1 battery of artillery.

Special Situation. Red.

The Red commander, receiving information of the inferior quality of the troops at Fort Agawam, or the careless way in which their outpost duty is performed, forms the idea of capturing the place. Accordingly he designates Colonel Z. for this duty and orders the following named troops to report to him early to-morrow:

2 battalions of infantry.

1 squadron of cavalry.

1 battery of artillery.

Upon receipt of these propositions the commanders called their officers together and assigned them to appropriate duties. The first point then was the issue of orders by the two chiefs. These orders were prepared in writing for submission to the umpire on the morning of the exercise, and were the only portion of the exercise required in writing. The umpire caused the orders to be modified in several points wherein they did not

conform strictly to the situation already described. He also found occasion to repress a tendency on the part of officers to give odd and startling solutions. Let it be understood that Kriegsspiel gives no scope for genius; it requires ordinary exertions from troops and postpones all unusual and desperate situations. We want safe leaders and not Napoleons.

Upon the day of the exercise the officers assembled at the map and the general situation was explained by the umpire.

The representatives of one side then retired while the special situation and the orders of the other side were read. The officers commanding portions of the command were then questioned upon the manner of carrying out the duties assigned them in the order. In proportion to the care with which they had studied the situation and its various possibilities, would they be able to answer promptly and in no uncertain words. No better object lesson in the necessities of many officers is needed than this first introduction to Kriegsspiel.

The troops were placed on the map by the umpire in accord with the information thus obtained. The umpire next prepared a memorandum record to show the changing positions of the troops at different moments in the progress of the exercise. Thus:

BLUE.

7:00 A. M. Cavalry point is 300 yards north of Fearing's.

When these points were settled, the map was covered with sheets of paper, or the blocks were removed temporarily. The Blues retired, the Reds came into the room and the same procedure was repeated.

These arrangements would inevitably bring about a collision of the opposing forces and the result would be a test of the dispositions and formations of each side. At the beginning matters proceeded rapidly, the blocks being moved over spaces covering a considerable time. But as the forces approached each other the time interval between moves was shortened.

At the beginning the principal points to be settled by the umpire were questions of visibility and the action of the cavalry patrols. The latter were decided arbitrarily to a large extent because we do not profess to give a representation of points in which the individual intelligence of troops enters so largely as it does in scouting. The numerous minor combats of small bodies were settled in a general way. The umpire was careful to re-

strain the ardor of the troops, remembering that their boldness in the manœuvres of peace is often in inverse ratio to their eagerness in war; on the other hand, he gave full credit to the confidence arising from greater numbers and superior tactical advantages. He tried to postpone the moment when the exercise would degenerate into a pitched battle, for then it was to end. His authority was exercised to prevent an advance in insufficient strength, and to compel a corresponding retreat of a weaker force, thus keeping the troops apart until the moment when a further change in the situation was not likely to occur.

It appears best to check these tendencies to rush into false and unreal positions, rather than to take the common method of awarding great losses for movements that could never have occurred. A loss that seems relatively small to an outsider will be accompanied by a surprising amount of work, fatigue and demoralization. A company commander who will incur a loss of a single man, when he could have performed his duty as well without that loss, will soon lose the confidence of his men. Unusual sacrifices are rare in warfare, and it is not teaching a doctrine of timidity when it is insisted that the first duty of an officer is to learn to spare his troops.

Let me now attempt to sketch something of the course of events as this problem developed them.

The Blue cavalry was placed with three troops on the high-road, and the fourth troop on the roads at the north and south. The Red cavalry had two troops on the high-road, one troop at the north and one troop at the south. Both had an advance party of one platoon on the high-road. From Agawam to Titticut is a distance of ten miles, and midway between the two is Fearing's farm not far from the point where the turnpike goes down into the valley of the Cohaset. The cavalry of each force left camp at 6 A. M., and marching at a walk and trot, the advance scouts reached the neighborhood of Fearing's at 7 A. M. The Blue scouts ascended the hill and came face to face with the Reds just as the latter entered the stretch of road north of the house. Both halted, a few wild shots were fired, and in a half a minute the advance parties were themselves in presence. Now came the moment for quick decisions from the leaders of the two parties. Interrogated separately by the umpire, Lieutenant B. of the Blues said, "I charge at once with every man"; Lieutenant Y. of the

Reds said, "I halt, dismount, and open fire with carbines from the farm buildings on the side of the road." All eyes were turned on the umpire who said promptly, "The advantage is with the Blues. The Reds can not execute their orders in time." One minute of time more and the victorious Blues ran into the head of the Red column of cavalry. Several Blues were captured, several were unhorsed and the balance got back again, followed by a portion of the Reds who were now in some disorder. Meanwhile the three troops of Blues, hearing the shots, trotted up and reached the top of the hill. Remember, by the way, that this is an ordinary bit of country road, with less than fifty feet of roadway, shut in by wire fences on each side. What will these cavalry commanders do now when each sees this cloud of dust hiding an unknown enemy a couple of hundred yards away? Their answers were almost identical. Each sent his leading troops forward at the charge while endeavoring to hold the remainder in hand. The rear troops cut into the fields on either side of the road and, some mounted and some dismounted, took part in the action. In three or four minutes, the three troops of cavalry aided by a better position defeated the Reds and were in turn stopped by the Red advance-guard at Horton's hollow. The Red cavalry was not able to take part in a new action for fifteen minutes.

A variety of new situations were developed by the superiority of the Red cavalry on the roads at the north and south of the turnpike, while the infantry of the Blues kept on advancing through the valley. The hills at Fearing's were the decisive point of the day. If the Red can get there first and place their artillery, they can sweep the valley as far as the Wewcantet village, and can probably throw back the advancing Blues. If Blues can establish themselves there, they can neutralize the hostile artillery and defeat the infantry by their superiority of force and position. Here the Reds won through defective dispositions of the Blue advance.

The exercise was followed by a criticism by the umpire and a discussion by the participants.

In this way the class of officers proceeded with an active practise of map manoeuvres or Kriegsspiel. The exercise which I have outlined occupied several sessions. The eight meetings of the lyceum season were arranged so that every officer was on the detail several times.

MILITARY HISTORY.

Shortly after the first of January, during the progress of the Map Manœuvres, the officers were notified of the character of the course in Military History which was to begin toward the middle of the next month. The explanation was as follows:

Eight of the sessions of our lyceum course are devoted to Military History. This is a subject that is often misunderstood. Our students reach too boldly for the master's degree, without bothering themselves with the drudgery of learning the primer. It is with a light heart that our military essayists tackle intricate questions of strategy and schemes for defense or invasion upon which books might be written. How usual it is to hear officers, who would have difficulty in leading a platoon over a mile of country road, talking aggressively about the strategy of Napoleon, the stratagems and ambushes of Hannibal, the reinforced flanks of Epaminondas, the drill manœuvres of Frederic, the concentrations of Moltke. Such a system presents the danger of substituting military pedantry in the place of knowledge. The exaggerated professionalism of Frederic's veterans on the eve of Jena is a sad example of the spread of worthless military information at the expense of vital principles. This desultory reading and essay writing is not entirely without benefit, but while it may add to your stock of general knowledge, it does little for your military education; it is about as useful as the reading of a book review instead of the book itself.

It is proposed to approach the subject of Military History in a series of essays and discussions upon points which we know have engaged the attention of our soldiers, and which we may be certain will arise before us in the early days of another war. In the limited sphere in which most of us would act, it is not likely that we would be bothered by grand strategy, but each hour would be full of anxious care about many of the minor points in which we would be called upon to exercise judgment and discretion.

We will choose an American campaign, presenting those curious phases which are peculiar to warfare in our own land, and we will make it a skeleton upon which to hang a few problems in the leading of troops.

Sherman's Atlanta campaign is selected because its literature is voluminous, the maps accurate and accessible, and because it can easily be made to show a thousand details of marching,

bivouacking, field entrenchments, outposts, advance guard, rear guard, reconnaissance, attack, defense, supply, foraging, etc. In many cases these details are hard to find because our military history was not written for students of the art of war, because their value was not foreseen in those days, and because the actors in great events quickly forget the small matters and only remember results. Nevertheless we will make it a study of details, and after getting the framework from published accounts, we will supply the gaps from our study of the text-books.

It will not be sufficient to say that Sherman detached McPherson to make a flank movement on Resaca. We want to know all about McPherson's concentration of his army and the marching orders down to the orders of many of his subordinates. By what marches, halts and camps was that army brought on a single road to the point where it was expected to issue from the mountain pass upon the line of Johnston's retreat? How were those things provided for, how executed, and why did it fail? Where was the cavalry, what did it accomplish, and how was its screening and reconnaissance duty performed? What problems of transportation and supply were presented and how were they worked out?

Similar questions are presented in the action of the other side in making a show of resistance upon an extended front and withdrawal from Dalton to Resaca. Then came the retreat from Cassville and beyond, etc.

Each officer will be assigned to work up some point and the nearer we come to fixing in our minds the duty of the lieutenants and captains the better we will accomplish our object.

No doubt we will miss the clever strategy of some of the great masters. Let us then remember that strategy often fails in the presence of good troops under equally good officers. Napoleon's strategy was always magnificent but failed as soon as the execution began to be faulty. It has often failed against the self-reliance and recuperative power of American troops. There is also a suspicion that much strategy has been manufactured after the event in post-mortem attempts to bolster up the reputation of some and to tear in pieces that of others. Moreover, it is often easy to draw opposite conclusions from similar events in history. The student is often puzzled by this. Thus we may deduce from the Eckmühl campaign that it is right to interpose your army between the portions of an enemy's extended front,

and from the Königgrätz and Waterloo campaigns that it is wrong; from Manassas and the Atlanta campaign, that it is right to make a detachment to strike an enemy in rear, and from Kulm and Hanau that it is wrong.

As an example of this kind of work let each of us suppose himself in the place of one of Grant's division commanders on the day before Shiloh. If mistakes in the outpost and reconnaissance duty were made let us show that they would not be ours. Thus throwing the light of history upon our problems we learn many lessons.

WAR RIDES.

In former exercises the ground was represented by the map, and the troops by the blocks in Map Manœuvres, or the troops were entirely imaginary in the written exercises. This practice seems to have filled its mission, which was a limited one as I have explained.

But it must be confessed that the best map gives a very poor picture of the ground. We only accept it as a guide in the darkness, to be supplemented by the real ground drawn in full day upon the human retina. Hence the time has arrived when we may advance another step in our career and solve our military questions on the ground itself, but still without the presence of troops. By taking up some of the problems that we have worked out indoors, we will best understand the relations that exist between the ground and the map. We discover at once the defects in the best topographical work. We verify, among other things, the statement that only general directions can be given from the map and that details must be left to the man on the ground. The troops must for the present remain imaginary because our object is to develop the military eye, and the habit of making correct decisions throughout the roving incidents of a day. If the troops were present, you would be hurried and hampered by their care.

A distinguished officer once told me that long after the war was over the habit clung to him of solving the military capacities of every landscape. Mechanically he found himself sending his skirmishers through every field, arranging his lines, establishing his batteries and posting his reserves; now weighing chances of defeat, now gathering squadrons for attack. No doubt, his mind did also people each bit of road or field or woodland with its

struggling hosts, and banners high and corpses in the dust. It was so because these things had been burned into his soul on many a hard and doubtful day of war. He said that from boyhood he had been a so-called professional soldier, but that outside of drill and discipline his knowledge of the practical side of his business was nothing when the war began. He had made many mistakes, but, fortunately, they were so greatly overshadowed by the more dazzling blunders of other 'professionals' in a wider field, that they escaped notice and he was able to go on learning by the failures of others. This hiatus in the training of that day is what we are now trying to fill. The future may be nearer to us than we think, and national cemeteries filled with the military 'mistakes' of professional soldiers, let us hope, will be scarce after the next war. To those who go through life trusting that some God-given ray of genius will surely pierce their understanding and enlighten the day of action when it comes, I say, do not deceive yourselves. Mortals who are favored in that way are rare. Study attentively the experiences of Grant at Shiloh, Sherman at Bull Run, Lee in West Virginia, and Jackson at Falling Waters. Reflect upon what would have happened to some of these commanders in a Chinese or a Turkish army.

These excursions to which we will now give our attention will be named 'War Rides.' By analogy to that familiar term—the 'sham battle,' which we justly reprobate,—they might be called sham manœuvres. They have a wide application and may vary from the duties of a small patrol to the great operations of a campaign. Thus on a modern field of operations a detail of officers might have in mind Johnston's retreat by successive steps before Sherman's advance in Georgia, selecting defensive positions beforehand and indicating the lines of intrenchments to be occupied by an imaginary force. Remembering the work accredited to the German staff before the war of 1870, another detail might ride out to select ground for future battles in a neighboring State,—arranging tables of march, artillery positions, requisitions and quarters for troops. Or to take a more familiar terrain, we might encamp our thousands on a league of ground about Fort Agawam, or force a passage of the Woonkinco, or delay an enemy from the positions of Scituate and Onset. For the present, however, the problems will take a more elementary form. The questions will be answered verbally or in writing after a study of the open country. Some difficulty will be experienced

at first in giving sufficient variety to the exercise, while keeping a supervision of it. It is easy to set problems covering a wide extent of country and a variety of military duties, but it is hard to watch the work of each man, to assist him by advice and to point out his errors. The earlier exercises are to be selected with this end in view ; afterwards, a greater range will be given and more independence of action will be allowed. Our War Rides will take place in the early spring and will continue with more or less frequency during the entire period preceding the manœuvres of the troops in the fall.

WAR RIDE NO. I.

The object of the first exercise was to get a general idea of the country and to give an object lesson in scouting. All officers below the rank of major took part. On the day designated, about the middle of the month of April, the officers assembled, mounted, at 7:30 A. M., and the commanding officer explained the exercise as follows :

For the exercise of to-day, the country west of the post is selected, comprising an area of fifty or sixty square miles.

The scouting will be from a north and south line through Sippican, westward to the post. The officers will ride to their positions so as to be there before 9:30 A. M., and will begin scouting at that time. The objective point is the parade ground of Fort Agawam at 12 M. You will see that you are now doing a portion of the scouting and screening duty of some of our previous exercises.

Four groups of officers will be formed, after deducting those who are to represent an enemy. To each group a route will be assigned. The senior will conduct the operations of his group and will detach officers from time to time on the various missions contemplated by these instructions. Each officer when detached, may consider himself to be followed by a patrol, and each chief of a group may consider that he commands one of the contact troops of a cavalry screen. The particular mission of each group is to discover other groups distinguished by their brown uniforms. These groups will be either concealed or marching. If marching they will be on a wagon-road sufficiently well defined to permit passage of cavalry or infantry in column of twos. If concealed in open ground, they will be so placed as to have a field of fire for 200 yards on the road, and will not take advantage of cover that

will not conceal a battalion of infantry, or a squadron of cavalry at least. If concealed in woods, they must be near enough to have a good fire on the road. These rules will enable you to avoid beating every cover that would conceal an insignificant force, but it will be necessary to search groups of buildings, ravines and woods, and to ride to the crest of many small folds of ground. On discovery of a body of the enemy, ride up to the commander and hand him a regular patrol report addressed to me. The report will state the fact of meeting, with time and place, and will be brought to me at the rendezvous. After being passed on the road or after having been discovered, the Browns will also go to the rendezvous.

The gaits employed will be walk and trot of the cavalry drill book; the gallop will not be used in these exercises.

It is hardly necessary to say that the actual contact of hostile forces is not contemplated. It is simply intended to impose the task of making such an examination of the country as you would make in actual service. If both sides do this work equally well, the hostile groups must be discovered.

A written slip was handed to the chief of each group giving the route to be followed in each case. The Browns were also instructed and the exercise began.

At 9:30 A. M. therefore the four groups were ranged on the line through Gibbs' Sage's Sippican's Croft's, as they had been directed, and within a few minutes of noon they rode into the post from the several directions.

The conductor of the exercise assembled the officers, questioned those who had commanded groups of both sides, and gave the result as follows :

Of the four groups, number 1 was deceived by a false trail on a side road; number 2 discovered the enemy in a ravine of the valley of Cohaset Creek near Brinley's; number 3 did not discover the enemy; number 4 discovered him behind a fold of ground west of Bourne's.

This exercise, repeated in a different direction each day, gives an excellent practice in some of the essential points of scouting.

WAR RIDE NUMBER 2.

A detail of cavalry officers reported at 8 A. M. on the morning following the last of the scouting exercises just described. The officers were provided with map, pencil and memorandum pad.

The squadron commander received them and gave the following instructions :

Gentlemen: Open your maps. You will bear in mind the problem of an advance from Titticut. Put yourself in the positions of the commander of a contact troop on the road by Croft's-Sylvester's-Bourne's. At Bourne's you get a message that the planks of the bridge over the creek have been removed, and that a platoon of the enemy's cavalry is dismounted on the high ground west of the bridge. You are required to make a report on the following questions :

1. What do you find from a reconnaissance ?
2. What verbal orders do you give? This does not mean the commands of the drill book.
3. What plans do you make ?
4. What message will you send to the rear ?
5. Make a tracing or sketch showing your dispositions at 1200, 800, and 400 yards from the enemy.

The message referred to in the fourth question will be written on a regular message blank and will be attached to your report which will be submitted to-morrow morning. You may start at once.

The delay detail was made until all the cavalry officers had solved the problem. The squadron commander then took the bundle of reports and rode out to the ground, where he read the papers and made notes of each. On the following day, he assembled the officers and rode with them out to the ground, and made the following remarks :

Reconnaissance shows broken and hilly country, not fit for mounted action. Cohaset Creek flows through deep, wooden banks, is boggy at most places but can be crossed on foot. At the north, we can get a sheltered approach to the creek bank where there is a good ford ; on the other side of the creek by this route, we can also get cover to within a couple of hundred yards of the enemy's flank or rear. At the north there is a ford at about the same distance, but it can only be reached by a considerable detour, and on the west side the ground is open.

The disposition to be made of the horses will determine the plan to be adopted. A frontal attack or one by the north ford would involve leaving the horses and make it necessary to repair the bridge before crossing. At the south, the horses can be kept

together, close to the troop, the line of retreat is in no danger, you can either attack the enemy in flank, or you can mount and leave him if you please.

The verbal orders will be as follows in sequence :

By signal to the advance party :

"Halt and observe the enemy."

Verbally to Sergeant A. :

"Take four men of the rear squad. Look for a crossing south of the road. Return in thirty minutes."

To Corporal B. similar orders for a patrol to the north.

By messenger to the commander of the advance party :

"The troop will cross at a ford half a mile to the south. Keep the enemy occupied until my attack begins; then follow me rapidly."

The captain makes a brief explanation to the troop of his intention to move under cover to the right and rear of the enemy, details an advance party and goes forward.

Accuracy of detail, combined with brevity, is important. These papers show numerous faults in these respects, but on the whole, they are very creditable for a first exercise. In the best solutions, the reconnaissance was as complete as possible, the troop was kept well in hand, when dismounted, the horses were not far away, a safe line of advance was taken and several courses of conduct were open after crossing the stream. These essentials of troop leading were not kept in mind by all. Some provide for an attack in front and on both flanks; others would allow the troop to get a mile away from the horses.

The Major further commented on the wording of the verbal order and on the form of the messages sent to the rear. He ended by reading several of the best solutions.

On the same day a detail was made of infantry officers to work out a phase in the march of an advance guard, and artillery officers were given questions to solve in the appropriate duties of their own arm.

As an elementary form of work, this exercise has several advantages; it can go on each day of the target and drill season with only such a number of officers as can be spared from those duties; the small number of papers handed in each day can be carefully examined and scrutinized by the superior assigned to the work; and it gives an abundance of time for a study of the questions.

WAR RIDE NO. 3.

The variety that may be given to these rides is only limited by the boundless possibilities of actual war. As the officers acquired more skill and confidence the exercise progressed more rapidly and covered more ground.

A useful form of the exercise was as follows :

A detail of officers rode to the eastern end of the iron bridge over the Woonkinco. Each officer was provided with a map, a pencil and a pad of "message blanks." Upon arrival at the bridge they dismounted and the orderlies led the horses to the rear.

The field officer in charge of the exercise then addressed the party as follows :

"It is 7 o'clock in the morning. You belong to a squadron of advanced cavalry of a force coming from the west. Whether it will camp at Fort Agawam to-night or not will depend on future developments about the enemy. When last heard from the enemy was camped along a creek about four miles east of Sippican.

"Your advanced party is now at the west end of the bridge."

After the officers had been given time to fix the situation in their minds they were rapidly questioned upon such points as follows :

"What would be the composition of the cavalry point ?

"How would it approach and cross the bridge ?

"What disposition would it make on reaching the eastern end of the bridge ?"

When these matters were settled the Major said :

"It is probable that the cavalry commander would have been riding with the first formed body of troops and would have joined the vanguard which had halted just beyond the bridge.

"Several questions would be presented to his attention. To make it certain that his infantry will not be attacked in the defile of the bridge he must examine the country for some distance to the front and flanks, and must hold the high ground at the east of Fort Agawam until relieved by the infantry or until the enemy has been surely located at a distance.

"Now write the dispositions of the cavalry commander. Twenty minutes are allowed."

At the end of the designated time the Major said :

"The solution of Lieutenant X. is accepted. It is as follows :
'The main body, being about two miles in rear, we have more

than forty minutes in which to make our reconnaissance, without delaying the head of the infantry column. Cavalry patrols will trot six miles in that time and we can walk our horses to Wewantet village in the same time.

"Two patrols are sent out at a trot. If the enemy is discovered they will observe him and send duplicate reports to me and to the infantry commander at the bridge. If the enemy is not discovered the patrols will report to me in 45 minutes at Wewantet.

"Patrol No. 1, 8 men and a non-commissioned officer, moves toward Nemassaket.

"Patrol No. 2, 6 men and a non-commissioned officer, moves by Fort Agawam towards Bourne's.

"These patrols are taken from the troop of the vanguard which is now reinforced by another troop and moves out toward Wewantet in proper form."

Officers were detailed to ride over the route prescribed for the patrols under the supposition that an enemy was not encountered. The balance of the party then rode to the village, where the patrols reported in due course and were closely questioned as to the extent of country traversed and their observation of it.

The Major then said :

"Our patrols report no signs of the enemy. The infantry of our main body ought to be now crossing the bridge which they will do without difficulty. I decide not to wait to be relieved but will push on to try and locate the enemy. Write your dispositions at this point. You will have 20 minutes."

The accepted solution stated that owing to difficulties of communication an entire troop would be detailed to explore the roads north of the turnpike and a second troop on the roads to the south. They were started out 15 minutes ahead of the main body, one by way of Conkling's and the other by way of Bourne's with orders to communicate with the main body at all cross-roads.

The officers were told to imagine themselves in the place of the commander of the troop moving by Conkling's and the party then rode in that direction.

At Prince's the Major announced that a connecting patrol dispatched to the south had failed to find our troops but that four guidons of the enemy had been counted on the Sippecan road, moving west.

The various phases of the military situation, thus developed, were then discussed. The decision was finally announced to leave the troop concealed at Prince's while patrols were sent out to observe the high road and to try to discover the force and intentions of the enemy. A report, in proper form, giving the result of operations up to this moment, was written and discussed.

The detail of officers then followed the fortunes of a patrol riding by Gibbs'-Sage's to reconnoitre the village of Sippecan. This closed the exercise, and the party returned to the post during the afternoon.

The War Rides were distributed at convenient times during the period preceding the field manœuvres of the garrison, it being understood that the rides closed the course prescribed for officers without the presence of troops.

Throughout every effort was made to give the course a progressive character, having in view the fruitful lesson that it is wrong to throw a man into deep water before he can swim in the shallows.

CONCLUSION.

The criticism of the last ride was closed as follows:

Some indications have been given for a course of training for officers which could be applied throughout our army at once, without legislation, or appropriations of money, or orders from a higher authority. Its aim is to make each battery, troop and company a school, and each garrison a university for the study of the duties of our profession. It dispenses with recitations at posts and uses text-books only for reference.

One of the results of such a course would be to improve the curricula of our schools of application and enable them to be turned into veritable war colleges and staff schools. Subjects now studied by a few would be universal in the service. The practical ability of officers and not their book learning could be tested in examinations for promotion. With improvement and development and comparison of methods, new fields for the enthusiasm of our best officers would be opened. Continuous practice and study might be necessary to keep in touch with your profession,—thus discouraging details and turning our bright men from attractive civil pursuits. For the indifferent and the indolent there are remedies in the examination for promotion and in the 62d Article of War.

It has been within a comparatively short time that the

most methodical nation in the world has reduced the leading of troops to an exact science. The Germans have utterly dispelled the fallacy that "*War alone teaches war.*" Under a careful system of peace training, they have been able to develop safe leaders for great armies in the field. No private soldier among them carries a marshal's baton in his knapsack, their "lords of war" must struggle along in subordinate positions until past middle life, but their veterans of forty years of peace service take the field with the serene confidence of men who have fought in a hundred battles. Their Napoleons and Cæsars are at this very moment writing books and working out kriegsspiel problems. Thus has the character of war changed.

In closing now the labors of the class of officers at this post for another year, let me urge you to give serious thought to these words of Ruskin:

"The sin of idleness is a thousand fold greater in you than in others; for the fates of those who will one day be under your command hang upon your knowledge: lost moments now will cost lives then, and every instant which you carelessly take for play, you will buy with blood."

Following are samples of the message blank and envelope, reduced to $\frac{1}{4}$ size:

SENDING DETACHMENT	LOCATION	DAY	MO.	HRS a. m. or	MIN. p. m.
RECEIVED,					
To					

To	ARRIVAL
	DEPARTURE RATE OF SPEED
This envelope will be returned to bearer.	

LAND MINES.

BY FIRST LIEUT. GEO. L. ANDERSON, 4TH U. S. ARTILLERY.

FIXED mines—both land and submarine—passed out of the condition of theory and experiment and became effective and legitimate weapons of defense during the American Civil War. The apparatus, hastily contrived by the Confederates in desperation for lack of a navy, and the skill with which they turned it to the protection of their long seaboard and certain inland places, are the subjects of a long chapter in the record of human enterprise.

They had not in the beginning materials or trained men or, to any great extent, the experience of others to guide them, yet their mine operations were so successful as to wear away the first feeling of indifference felt toward them by the Government which was finally led to adopt similar means and methods. During the rebellion 37 vessels were sunk or put out of combat by torpedoes while not more than half a dozen were equally disabled by the more costly guns on shore. After the first casualties, no federal vessel ever ventured to pass over waters suspected, or known, to be mined while they appeared seldom, or never, to hesitate in sailing past sea-coast guns.

Both the water and the land mines were of all sizes and shapes, often made out of materials intended for other uses and laid by men detailed from the different arms of the service; ninety per cent. of them were operated by purely mechanical devices in great variety which were uniformly subject to speedy deterioration. They would sometimes explode prematurely causing accident and at other times miss the one chance and excuse for their existence and not explode. Still the use of them continued to increase to the end of the war, and after its close many European nations, as a result of their observations in America, appointed torpedo boards and undertook at great expense long and thorough experiments to develop systems of mines. England, Austria, Sweden and Denmark took the lead in the investigations abroad, but the most extensive and reliable trials were made subsequently in this country by an engineer officer. Several powers now keep land torpedo apparatus and stores, as well as submarine, in readiness for war

and a small body of men in training to lay them, and the methods of their operation are laid down in manuals.

Thousands of land mines were planted during our Civil War outside of fortifications and in passage ways it was desired to obstruct. They were found around Savannah, Fort Wagner, and in several places on the Peninsula. The failure of the attack on Fort Gillmer in 1864 was due, Captain McEvoy states, to them. These were simply 9" spherical shell filled with gunpowder. A sensitive fuse in the usual fuse hole was capped by a little fulminate and over it was placed, without touching the fulminate, a conical tin case which slid down and fitted closely over the spherical form. The shell being placed just beneath the surface of the ground, a half pound pressure of a man's foot was sufficient to force the tin case down and explode the shell. It was a crude device, hastily improvised to meet an emergency, dangerous to plant and, when no longer required, to take up. It was liable to become inoperative soon after being set and there was no means of ascertaining its condition. It lacked most of the requisites of a good mine, but still accomplished very well the purposes for which it was intended.

During the siege of Paris, 1870, the French placed land mines in the dead angles and at few other points outside the main city fortifications where streets from the suburbs led within. The avenues of Châtillon and Orleans were two of the sites selected. For instance, in front of the latter's porte five mines operated electrically were placed 100 yards apart along the middle of the avenue. The battery and operator occupied the small recess, previously blinded, where the city taxes on produce entering town are usually collected. Traffic went on as usual over the mines and the enemy was informed of their existence with good effect.

The English have successfully laid gun-cotton mines fired by electricity. In the Soudan the cask containing the charge, fuse, battery and circuit closer was placed just beneath the surface. It had two circuits normally open—one leading to a key in the fort and the other to the circuit closer in the cask which closed only when the cask was turned over. It could thus be fired in two ways—by an observer in the fort or by the enemy in attempting to take up the mine. Attempts made by the Arabs near Suakim to cut the wires during darkness and remove some of the mines were attended with such consequences as to make night attacks rare. Gordon's improvised mines were of the roughest descrip-

tion but they delayed the fall of Khartoum. According to the diary of one of his officers, 9 mines exploded one day disabling 140 of the besiegers.

The Austrian government paid \$20,000 for the patent on its land mine. The case has two compartments, one for explosive gelatine and the other for the detonating apparatus. Three electric wires leading from it served to arm or disarm or explode the torpedo. The field type weighs 4 pounds and a mule with the flying column carries 24 of them to secure the halting places at night; that for permanent fortifications weighs from 30 to 100 pounds. The radius of destruction of the 4-pounder is 20 feet and of the 100 pounder, 400 feet. It is claimed that 60 Austrians can block a front one-half a mile long in fifteen minutes and that two or three field mines hidden in a roadway will render it impracticable.

The Russians have made use of a cast-iron case containing pyroxyline which is operated mechanically by means of two wires at a maximum distance of 2400 feet. The upper part is arranged to break into a great many fragments. Fifty trained men can plant 170 mines of this kind in half an hour and render a front one half a mile long unapproachable. Russians mines arrested the attacks made by the Turks at Shipka Pass, August 21, 1877.

In Italy the case of the land mine is of metal, six-tenths of an inch thick and is shaped like a funnel. It holds $3\frac{1}{2}$ pounds of explosives, the nature of which is not known, and is fired electrically. By means of a steel spiral beneath, it is screwed into the ground.

The Belgians keep a large stock of torpedo material on hand. They expect to make extensive use of mines in case of war and guard well the secret of their system.

It is difficult to obtain reliable data upon this subject. The countries mentioned have given it the greater amount of attention and reference has been made only to the most notable successes obtained with land mines. The record of their failures is much longer. These have been due to imperfect methods of construction and lack of knowledge and skill in handling. They have been hastily built to meet an emergency, their preparation has not been undertaken until after the war began and the necessities of the defensive became urgent. They were then laid by untrained hands. Their condition could not be known until tried by the enemy and the explosive has usually been gunpowder.

The mechanical class in which the fuse is fired by a blow or friction is still retained to a small extent. The Swiss mine of Pfund and Schmid stands perhaps as the best of this type only because the number of its faults is less than in others. Its iron shell, 8 inches in diameter, is hemi-spherically shaped to afford a base and is cast in three concentric layers, each about $\frac{1}{4}$ of an inch thick, so that it will break into a great many pieces. The charge of about one pound of gun-cotton will distribute 200 splinters over an area of 100 yards in radius. The brass detonating mechanism for firing the mine resembles that in the bolt of our service rifle. One end screws into the top of the shell and its upper end has a movable contact piece which on being pressed downwards or sideways releases the firing pin if cocked. The pin is cocked and locked as in the rifle. It can be doubly locked by means of a staple pushed through two small holes of the casing so as to engage the firing pin. A string or light wire, 100 yards long, is fastened to the staple.

To set it, dig a small hole 8 inches deep; then in regular order cock the bolt, double lock it by means of the lock and staple, screw it into the shell previously charged and, after laying the mine in place, cover with dirt. The main lock is unlocked just before the last dirt is thrown on. Then at 100 yards distance pull out the staple by means of the string and the locality at once attains an importance which the operator is in honor bound to describe particularly to his friends and to give notice against trespass in a general way to the enemy. To take it up later, it will be necessary first to find the mine—a preliminary almost as difficult as that to cooking the historical hare; then remove the top earth carefully and insert the staple as soon as possible.

Its imperfections are quite apparent. It can be fired only by the enemy and when he is directly above it; the operator has very little control over it after being set; he can not fire it or take it up, when no longer required, without danger; if in good order it fails to distinguish between friends and foes, and its mechanism is quite liable to be damaged by rust. Generally it may be said that a case containing explosive and a friction primer or percussion cap or acid and chlorate of potash, with a mechanical device just over it for operating, is a precarious package to handle.

On land as on water torpedoes are to be regarded as simple and inexpensive adjuncts to the usual means of defense. They supplement but do not supplant. They can be made powerful

adjuncts in demoralizing and, often unaided, in defeating the assailants. Perhaps, not one mine in twenty planted will ever be called into action, but it must not fail for any cause when its opportunity arrives. It must not only be certain to operate then but its operation must be effective. These results can be obtained far more readily on land than on water.

It is believed that land mines should possess the following qualities :

- 1st. Destructive in a horizontal direction ;
- 2d. Simple, portable and cheap ;
- 3d. Safe to plant, pick up, verify and fire ;
- 4th. Capable of explosion by the enemy automatically and by the operator ;
- 5th. Unaffected by dirt, dampness or temperature ;
- 6th. Capable of being made instantly dangerous or safe at will ;
- 7th. Admit of concealment.

Some of the developments which have been made in the industries within the last few years render it possible to secure for mines the more essential of the foregoing properties. A reliable explosive, such as gun-cotton or gelatine, five or six times stronger than rifle powder for mine use, may now be obtained in the market and will lie for a long time uninjured under the conditions imposed. The modern dry cell will stand on open circuit in store or in a mine for a long period without deterioration and will act promptly and with its full effect when called upon. One cell may redden a bridge fuse. The bridge fuse surrounded by a little gun-cotton or mealed powder, well sealed up, has replaced all other kinds of electric fuses and such uniformity in manufacture is now obtained that the current strength required to fire will not vary by one per cent. Quite as important are recent industrial methods adopted for insulating all of the active parts of an electric system from each other and making them dirt and moisture proof.

These improvements have been appropriated by Dr. Weber of the Neuchâtel Academy in his recent and very ingenious land torpedo. It operates with certainty under water or ground. A small hermetically sealed battery is placed within or near the mine case. From the case two insulated conductors lead away to a rubber tube which if pressed or stretched or cut at any point of its length will produce explosion. The rubber tube is laid in the

dust across a road or in the grass of a glaciis over which the enemy may pass or in the jamb of a door which he may open or along a barricade likely to be disturbed. It may be set in a river or shallow water where hostile boats are expected. In laying, the shell containing the charge and bridge is first placed where it promises to do the most good, then the rubber tube is put in a hidden position most likely to be misplaced by the enemy, and finally the two conductors from each are run to a third position safe from premature explosion where the circuits are verified and joined to the battery. The various parts are safely taken up in inverse order.

In another mine, the explosive is sealed up in a cast-iron case, the battery is contained in an earthen or glass jar, the circuit closer is effectually sealed up and all of the other working parts are sufficiently protected against injurious action from water and other causes. Its condition under ground will remain good for a long period and may be verified at any time. It may as readily be taken up as laid down and fired either by the observer or by the assailant passing over it or over any one of a number of places in its vicinity. Three or four cells will serve a large number of mines which, if an area requires protection, may be arranged like submarine mines, in groups or skirmish line order.

Any one of them will give warning of a hostile approach in fog or darkness or when, for other reasons, he can not be seen. It is certain in its action and very cheap and simple. The horizontal effect of the ordinary bursting charge has been increased at the expense of the upward and downward effects. If an area is to be guarded the effect will be approximately the same in all horizontal directions; if a passage way the greatest effect will be made to occur in a longitudinal direction.

The shock action alone of a mine charge of high explosive is not sufficient. The detonation of six pounds of gelatine or gun-cotton will not inflict serious injury outside of a radius of six yards. The explosion of 46 tons of powder and 30 tons of dynamite at the Cape of Good Hope in 1884 did no harm to men fully exposed 500 yards away. The containing case should, therefore, be of a nature to break into a great many fragments. The destructive effects may be further increased by placing stone, broken iron and other hard materials at hand around the mine case when in position. It is estimated that three drilled men can set a mine free from observation in ordinary ground in 30 minutes. If the radius of destruction of a 5-pound mine is 10 yards, a company

can plant in an hour 2 acres or protect a front $\frac{1}{4}$ of a mile long with material hauled by 4 horses at the usual rate of marching.

When possible, mines will be laid in positions which can be swept by gun fire in order that the enemy may not take an undisturbed survey of the ground. Those positions will be carefully indicated upon a map and a rough reference made to them upon the ground by blazing trees, marking boulders, etc., in such a way that the marks will not attract attention. The mines will be placed in rows, quincunx, or echelon order for better protection and subsequent search, if desired.

The sites, ordinarily to be selected, will be just outside of a fort where the assailant may congregate or over which he is likely to pass in a night attack, again, where entanglements are usually placed or vigilant sentinels are required, along the flanks of a defensive position and in the approaches to it if an open assault is dreaded and in mountain defiles. In the retreat of an army or any portion of it there is no means more ready and better calculated to discourage a close pursuit. The mine is the weapon of the defensive. It is continuously operative. All other weapons fail during fog and darkness or more than one half the time. If the enemy shall always be apprised in a general way of the existence of a field, it will not only be in conformity with an unwritten law of war but will really add to the effectiveness of this means of protection.

To make this means as secure as now possible it appears to be well settled that—

- (1st) The charge will be gun-cotton or other high explosives;
- (2d) The mines will be operated by means of currents through a bridge fuse;
- (3d) They will be laid by a few trained men and not by details—in sets of 1 to 7 mines to be operated from a single battery;
- (4th) The destructive effects will occur from fragments of the case and missiles laid around it and not from shock action;
- (5th) Success of any system is to be looked for mainly in simplicity of construction, safety in laying and certainty of action;
- (6th) Intimation to the enemy of the field's existence in order that this mode of warfare may always be open-handed.

ARMY UNIFORM.

BY CAPT. THEO. A. BINGHAM, CORPS OF ENGINEERS U. S. ARMY.

NOW that the issue of regulations for uniform has, according to press reports, been postponed, it may not be inadmissible to offer some suggestions on the subject, resulting from an experience which includes five years of observation in Europe on uniforms not only on gala occasions but in the field as well.

Let us, beforehand, consider what the ideal uniform should be (although ideals are never reached), throwing away all preconceived notions and traditions, and basing only on common sense and practicality, which are supposed to be preëminently American characteristics.

It will no doubt be granted that the ideal uniform should

1. Be suited to the work to be done.

2. After suitability has been obtained, possess a certain amount of ornament and smartness, because, on account of our mortal nature, smartness plays a not unimportant part in attracting recruits, under our system, and in satisfying the vanity of the military world.

The work of soldiers, which we should consider, must surely be that of campaigning and not of peace. Field service of soldiers is quite similar to that of pioneer settlers in a hostile country or of hunters. The process of natural selection has caused such people to adopt a dress

1. Of comfortable looseness, especially about the arms and neck.

2. Warm.

3. Full of pockets.

4. Made of materials which wear well and are as impervious as possible to wind and rain.

Such a dress is substantially of a dirt brown canvas, lined with flannel and full of pockets. Well-oiled boots and a lined (ducking) helmet of similar canvas complete the costume. Add to this a long canvas flannel lined greatcoat with high collar and plenty of pockets and about all has been done that is possible to enable a man to withstand the elements.

As regards "waterproofs" there is probably only one exception to the rule that they are not waterproof, viz., the so-called "fishskin" used by sailors or the "slicker" of the cowboy.

The ideal dress above described may be regarded as the best for the work yet devised by man, and a soldier's work in the field consists mainly of marching and camping regardless of weather or temperature.

There need be no fear that such a dress or anything like it will be adopted for the United States army in the near future. At the same time objections to it are bound to be sentimental or based either on ineradicable preconceived notions and prejudices or on that terrible bugbear "precedent."

All will, however, perhaps, agree that any uniform adopted will meet the requirements of common sense and practicality only as it approximates to the ideal costume—it being premised that common sense is not always possible or, at any rate, politic.

Before passing to specific suggestions for uniform, in which the question of ornamentation is avoided as much as possible, because the taste of no two officers would be the same, let me enter an earnest plea against the use of ornament beyond what is needed for distinctions of rank and arm; and this for two reasons:

1. It is contrary to the American idea regarding public officers of the general government.
2. It is an unnecessary hardship to impose avoidable expense on officers whose salaries are limited, who have frequently to change station by order, always at great expense, and who have, on account of the popular feeling regarding the standing army, to own also decent and necessary civilian clothing.

BOOTS AND SHOES.

The present regulations which permit officers and men to buy their own shoes is practical and has produced the best results and could not be improved on.

The regulation riding boot is good, but there is room for improvement in

SPURS.

The spur itself is well enough, but the method of attaching it by strap over the ankles and chain or strap under the foot answers no special purpose not answered by another device. This method permits the spur to become tangled with grass and bushes and involves an unnecessary trouble in cleaning and polishing.

Moreover this method requires for perfection a lug on the back of the heel to prevent the spur from falling out of place, or off entirely as sometimes happens.

The box spur, held in the heel by a strong spring and notch, is as rigid as the other, always in place, lighter, more easily removed and cleaned, relieves the foot of pressure and, when nicked, long retains its brightness.

LEGGINGS.

Although shapeless after a rain, they are on the whole a very satisfactory device, in use and appearance. It would be difficult to suggest anything better for foot troops who wear loose and long trousers.

TROUSERS.

These should have two hip pockets as well as two front pockets and should not fit too tight about the hips even for riding.

The watch pocket, however, should not be on the waist-band but on the abdomen, 4 inches below waist seam. This enables one to look at his watch without disarranging coat and belt, by the use of one hand; and the comfort of such a pocket when mounted is so great that it is to be wondered this position is not even a common one.

Speaking of watches reminds me to remind others of the watch wrist-strap, which is extraordinarily convenient, especially for mounted officers and for those who write and receive orders or dispatches in the field.

The most comfortable riding trousers are loose about the hips, rather close fitting just below the knee, button close just above the ankle and are held down by an elastic or strap under the instep.

UNDRESS COAT.

I have always wondered why soldiers, on land marching and fighting in dust and heat more often than in cold, have, from the earliest days of regular armies and in all countries, been compelled to wear high collared, tight-fitting coats; while sailors, exposed to wind and rain more often than to dust and heat and, as a rule, working in a lower temperature (in the temperate zone) than soldiers, can hardly get their clothes loose enough, or their collars to roll enough and have their chests and throats comfortably loose but much exposed.

If soldiers and sailors were now to be uniformed for the first

time, without knowledge of the past or of precedent, is it not more than probable that the fashions would be much reversed?

Can it be maintained for a moment that a rolling or turned down collar is not more comfortable than a tight high one, during physical exertion? Isn't a landing party of blue jackets better equipped for an assault or for the hot work of serving a light battery, and withal much smarter and jauntier in appearance, than any of our land artillery troops?

A coat with turned down collar can be so made as to button across the chest for protection if needed. The turned down collar does not affect the question of collar ornaments. The Italian army has it universally, collar ornaments included. Other armies have it. We once had it and not so long ago. During my own service as military attaché to our Embassy in Germany my turned down blouse collar was one of the few things of our uniform which the critical German officers found "*ganz praktisch*"—quite practical. As to the general style of our undress coat otherwise I have no suggestions to make except for pockets. There should be four on the outside and two on the inside. An officer in the field needs with him, handkerchief or its equivalent, pad of paper, pencils or pen, maps, may be a note book, surely matches, no doubt tobacco in some form, and a pipe, a knife, a few crackers may be, revolver ammunition, often a Bible or Testament and a picture or two, a hospital case for "first aid to the wounded," and other things not now recalled.

In case baggage allowance is reduced he may need to carry soap, comb, mirror, toothbrush, if so lucky as to have them, and where is he going to carry all these things if he has not capacious pockets and lots of them, especially if he be not mounted? If they be not provided he will certainly improvise them. The first requisite of any hunter's costume is plenty of large pockets; and the undress coat is officers' and men's field coat.

Why even for garrison dress all convenience in pockets for letters or notebook and pencil or handkerchief is sacrificed to the "looks" of a close buttoning blouse.

To be sure, bulging pockets spoil the looks of a tailor's lay figure but are soldiers to be made tailor's models? It is absurd.

The tasteful French people cover the blouse with round braid frogs and hide the openings of the pockets under the frogs. It is true these frogs wear out easily but not much more so than those of the overcoat.

If the difficulty could not be otherwise surmounted why not authorize a blouse for field service like the "good looking" or "military" peace blouse but with lots of pockets?

The present method of buttoning the blouse is perhaps to save life by doing away with the conspicuous row of brass buttons. Why then are not the buttons removed from the blouses of enlisted men?

Finally, is the ordinary single-breasted sack coat of the civilian so hideous with its pockets or with its neat comfortable collar, showing the linen slightly (not out of place in garrison for soldiers); or otherwise impractical that it would not be the best possible model for a uniform undress coat?

DRESS COAT.

If vanity demands more than the coat just described, made brighter perhaps with a single or double aiguillette, like the Italian, and brass buttons, why, our present dress coat seems as uncomfortable for the purposes of parades, courts-martial and full dress social occasions as need be designed.

The Italian and Japanese armies and many French regiments have the same style of coat for dress as for undress occasions—adding, however, some gold or silver lace and sometimes aiguillettes to indicate the jollity of the occasion.

SHOULDER STRAPS.

Nothing could be more suitable than our present patterns. In Europe (Switzerland excepted) these straps instead of lying fore and aft reach from neck to shoulder. But ours fit more closely, are better adapted to movements of the body and present no obstacle to the putting on or wearing of overcoat or cape.

SHOULDER KNOTS.

Our present pattern is unnecessarily ugly, ill adapted to movement of the body, weak in construction, almost a preventive of overcoat wearing, very expensive, and endured so long, it is believed, because we knew of nothing better.

Why is more needed than the present shoulder straps? They are much affected now by certain officers for use on the dress coat for "social" dress, leaving the ugly shoulder knot loop still visible at the neck.

If a special shoulder device for dress coats must be had, we might well adopt the flat European shoulder strap, worn like our

shoulder knot but lying close to the shoulder. It is quite as ornamental as ours, cheaper, and forms no obstacle to overcoats and capes.

Our present shoulder knot is a tasteless corruption of an epaulette without fringe. When the ornaments are of metal it is almost impossible not to tear off some of them by frequently wearing an overcoat.

At any rate, an equally handsome, more durable, more comfortable and cheaper shoulder device for full dress can easily be designed.

But I feel sure that after a little practice in one style of coat only, for dress and undress, our army would be glad of the added comfort and reduced expense.

SLINGING THE SWORD.

The Russian method by a belt over the right shoulder, sword at same height on foot or horseback, is ideal. The belt then merely holds the sword to the side and prevents its "whipping" when at a gallop. The belt being then without other load is available for two revolvers and a knife, which an officer in the field needs anyway, and on his person, not on the horse. This Russian method saves fatigue on long marches, and does away with belt pressure on the abdomen, from "thrashing" of the sword at trot or gallop. The sword is also much more easily drawn and returned than by our method. Hooking up and unhooking are done away with and no amount of awkwardness will cause one to trip over his sword.

SCABBARDS.

Here there is an opportunity for a great but simple improvement already universally in use in France and Italy.

The lower ring should be moved close up to the upper or abolished altogether.

The lower ring and strap are supposed to prevent the sword from falling in case the upper fastening gives way. But what is the fact? Hold our swords by the lower ring and they will turn upside down and in nine cases out of ten, especially when loose from service, the weapon will fall out. If it does not fall out, the rear strap is so long that the hilt will almost drag on the ground even when mounted.

Undoubtedly the lower ring should be so placed as to hold the sword upright and act as a reserve for the upper ring. The Ital-

ians so use it and the French have done away with the lower ring entirely.

SWORDS.

Our present patterns are equal to any except for the infantry and staff. Why should they not have a sword that is a sword and not merely a bodkin of no actual use?

The Italian gripe of smooth hard wood, grooved for the fingers is admirable and far better than our wire covered one.

BELT, UNDRRESS.

A belt of webbing, buckling close to the body is far more comfortable than stiff leather. If the rings of the scabbard be brought close together as they should be, the suspension straps can both be in bearing at once which will save wear on the rings; or the rear strap can be just a little loose so as to come in bearing at once in case the other fastening gives way.

Allien & Co. of New York sell a good model, as good as the Italian.

Attaching the sword by spring hooks, even when they are clamped by a screw nut is not the best way. No doubt the experience of others will corroborate my own in this regard. The hooks *will* unhook.

A small strap and buckle with guard loop will give way only by breaking.

A belt clasp also very often becomes unfastened—a buckle is the only sure fastening.

These suggestions are the fruit of bitter experience and mortification when in the field with German and Italian officers. My sword and belts were new and made by reputable New York firms, but they continually became unfastened or broke and always when I would have given worlds not to have the accident happen.

BELTS, DRESS.

The above remarks apply equally to our dress belt.

If the same style of coat or blouse be worn for dress and undress occasions, no dress belt will be required and much avoidable expense saved the officer.

FATIGUE CAP.

Is it possible our present pattern is regarded as a final solution of the problem? It is better than what we had just before,

but no one denies that it resembles that of the New York Fire Department or of the Broadway cable motor man.

The original fatigue cap as used during the war was adopted from the French and was a very practical pattern. But years corrupted its shape until no wonder a change was deemed necessary. But why adopt a "hideosity"?

The ducking helmet protects the neck as well as the eyes but its shape commends itself to no one's taste although its practicality is not denied. No *cap* has yet been devised that protects the neck as well as the eyes. Of all the fatigue caps worn by soldiers, the present French cap is the best and most tasteful. It is roomy, soft and "military" (whatever that may mean). It has a grand visor, long, broad and protective—all that a visor should be. The addition of a pompon or upright bunch of feathers makes it quite dressy for gala occasions—it can then too be easily removed and carried, when in-doors, under the arm—a frequent need of dress head covering. I believe it would give our officers and men universal satisfaction. The Japanese use this method and many Spanish regiments as well as some of other nations.

That would give a head covering suitable for all arms, by varying the colors.

DRESS HEAD GEAR.

Helmet.—Ours is commonly supposed to be the German helmet but it is as different as can be imagined. The English first corrupted the German shape and we have made the matter worse both in shape and weight. A properly constructed helmet is a very handsome head dress—see the picture herewith of a real German helmet.

The mounted troops suffer more from their helmets than the infantry. It produces headache and is very heavy.

Chapeau.—Did you ever see one on a horseman taking a fence in rainy weather? It is an absurd picture. The chapeau is no protection against sun or rain, wind or cold. It is hard to keep on in a wind or at a gallop. As made in this country, it is not graceful and I never heard anything advanced to recommend it for military use. In Europe it stamps an officer as a naval officer. At a ball or opera it is convenient to carry under the arm.

My remedy would be to do away with helmet and chapeau



and adopt the fatigue cap with a light upright bunch of feathers—or a fluffy pompon.

For generals the suggestion is made of a soft felt Prince Rupert hat with gold cord or a long feather or both. Such a head dress is serviceable and very graceful, ornamental and effective.

CAMPAIGN HAT.

Our present pattern, in spite of its lack of perfection, is eminently serviceable and I never saw a better.

THE SADDLE

is the best in the world (the McClellan) and is complete with its saddle bags and coat straps.

BRIDLES.

Ours are not the best. The German and English are better, but I do not feel competent to suggest on this point, for army use. Still an experience with horses from boyhood and what I have seen in other armies convinces me of the correctness of riding as a rule on a snaffle and not on a curb. Martingales should also be permitted when needed, as they are on some horses.

SADDLE CLOTH.

Our present pattern, lined with air-tight glazed leather, is altogether wrong. Either that leather should be full of holes or the cloth should have a felt lining.

For a housing under the saddle the German undress pattern of dark blue cloth lined with felt is what it should be. The full dress pattern is worn over the saddle.

An ingenious device to prevent a sword from "whipping" or "thrashing" is to sew a narrow leather loop on the left lower edge of the cloth, well to the rear, through which the sword is passed on mounting.

A pocket in the cloth on the right hand side is a great convenience.

OVERCOATS.

Our officer's overcoat is so good it ought not to be tampered with.

But the men's coat can be much improved on. It is still somewhat on the style of the former officer's coat. The skirts afford little protection as they generally blow aside and expose the legs. The collar is not high enough. The cape is an awkward addition even for use as a protection to the head.

The remedy is to make the overcoat fuller and long, down to just above the ankles—with a buttoning strap at the small of the back, a very high collar with a flap to button over the chin and lining throughout. The present non-commissioned officer's canvas overcoat is about the idea. Then button by concealed buttons, put in two deep side pockets with flaps and split it in the back from the bottom up (fastening if desired by buttons) for riding or convenience in walking. Such a great coat not only would marvellously increase the comfort of the soldier but does away at once with any necessity for his carrying a

BLANKET

which is unknown to the armies of continental Europe when in the field. When the German army was furnished, a few years ago, with shelter tents it was understood that they were intended for use only in a campaign against Russia where the country is sparsely settled, and the men could not be quartered in villages. But the carrying of a blanket was not thought of. The soldier, wrapped in his great coat with collar turned up, was sufficiently provided.

This considerable reduction in the field equipment is regarded as an important suggestion.

It is true that upon taking the field at present in summer the soldier would probably leave his overcoat behind. But he would take his blanket. Now if he can leave his blanket and take his overcoat instead, he is fitted for all temperatures.

The above remarks do not, of course, cover the whole subject, but this article is perhaps too long already.

The suggestions made certainly have no bias toward copying any one nation. The endeavor has been made to select from the experience of others what can be used to advantage or improved on by us, keeping in view as far as possible the ideal costume and considering how our present uniform can be best altered in that direction.

The changes suggested are in some respects radical, but it is believed that no change has been suggested merely for the sake of change or upon untenable grounds. At any rate, what has been said has sprung from an intense interest in the subject, based on an unusual experience for officers of our army; and from a desire to secure for our army what the Germans so strongly call "*Schlagfertigkeit*," or "readiness to strike."

BATTLE TACTICS AND MOUNTED INFANTRY.

BY FIRST LIEUT. L. F. DAVISON, 11TH U. S. INFANTRY.

THAT the tactical problem confronting a general commanding an army on the offensive is now more complicated and difficult than it has ever been before, needs only stating to be admitted.

To fully realize this we must call to mind that, during the score or more of years since any great battles have been fought in which the opponents were at all equal either in numbers, discipline or *morale*, and in which it is to be supposed that the plans were carefully outlined and based on scientific principles, numerous and important changes have been made not only in the personnel but especially in the matériel of armies: improvements whose importance can hardly be over-estimated and whose effect on modern warfare, from a tactical point of view, may be likened to that produced by a great cloud of mist which seemingly defies penetration.

The handling of infantry is especially befogged in this connection on account of the different and sometimes contradictory ways in which some of the recent inventions modify the action of foot troops.

A partial enumeration of these changes is sufficient to enforce our argument. They consist of increased facilities for communication, for obtaining and for forwarding information, by means of balloon observations, photographic reconnoitring, better optical instruments, better signal appliances, telephonic and telegraphic improvements, etc.; increased facilities for transporting supplies and troops, with the probable increase in the amount of supplies and the number of troops; increased range, accuracy and rapidity of fire for artillery and infantry, with attendant range-finders, special projectiles, high explosives, so-called smokeless powders, flat trajectories, magazine, rapid and machine fire; individual shields and bullet-proof coats; better tools for entrenching purposes, with the serious question as to whether field works and hasty entrenchments, by outlining and indicating the extent of the lines using them, will not be a detriment instead of a protection; emergency rations for troops and animals; and no

man knows what next. Improvements, or at least changes, all along the line, save perhaps in the absolute capacity of the individual soldier to cover more ground in a given time either on the march or while manœuvring in the presence of the enemy; nor is it at all impossible that constant effort and special training may not have increased this factor to some extent and that it may not be still farther improved when we consider the bicycle and other improved modes of locomotion, the kola-nut and other mooted propositions.

The armies of the world to-day face more new and practically untried conditions than at any previous period of the world's history, not excepting the beginning of that decade of great wars—1861 to 1871. The relative peace interval may at times have been longer, but never before has invention been so active, nor have real or fancied improvements been so numerous as during these last twenty-five years of comparative quiet.

It is generally understood, and indeed so far admitted as to have become almost axiomatic, that these modern changes produce little or no effect on strategy; but every change in fighting matériel has had a more or less important effect on tactics. The government whose armies have been most alert in foreseeing and adopting tactical changes to meet the new conditions has always been well repaid for its vigilance and always will be. Every reader has marked apposite instances of this as far back as the time of Alexander and down to the late hopeless and almost farcical struggle of China against Japan. Gustavus Adolphus, the great Frederick, Napoleon Bonaparte, each in turn made important tactical improvements by carefully noting and taking advantage of new developments. As might be expected, the genius and versatility of the American people is perhaps nowhere better illustrated than with reference to the manner in which they carried on the war so suddenly thrust upon them in 1861. A well-known military writer* characterizes this war of secession as being "remarkable as a turning point of tactics, there being scarcely a feature of the tactics of the present day† that did not have its germ, its prototype, or its development in that great contest." Taking up the question where we left it in 1865, Von Moltke and other great generals in turn left the impress of their vigorous minds on the subject under discussion until it

* Captain Wagner.

† 1894.

would seem that hardly an argument *pro* or *con* can now be advanced that has not already been practically exhausted.

The nineteenth century has been well named a "century of invention," and its last quarter bids fair to overreach the mark, especially with reference to the equipments and accessories pertaining to armies. That these innovations are the cause of a vast amount of disquiet is evident from recent changes in army organization by nearly every great power, by changes in tactics that amount in many cases to a complete substitution of new methods for old ones, by the extensive literature written on the subject, and more recently by frequent articles in the service magazines of different countries which in most cases take the form of personal discussion in which one writer simply endeavors to overthrow the propositions made by another. These discussions, while temporarily confusing, undoubtedly result in much good and will clear the military atmosphere so that eventually principles will be sighted from the enunciation of which proper formulas may be deduced and suitable tactics worked out. The Post Lyceum is supposed to be a favorite method of promoting such discussion, and, while its chief aim at first might have been the education and improvement of the individual officer, it is not at all certain that the scheme has not already attained a higher importance, see Part II., G. O. No. 58, A. G. O., series 1895, in calling forth individual suggestions for the solution of knotty problems. It is greatly to be desired that a suitable organization with its complementary tactics may be decided on during time of peace, and without that fiery birth which so often attends the ushering in of a new status. Experience teaches, however, that all lasting and important reforms are preceded and accompanied by serious upheavals. Thus the evolution of modern infantry tactics is easily traced in successive and vigorous steps from the time of the invention of fire-arms.

The change from the old column formation with its shock action, to the intermediate line formation, and down to the modern attenuated firing line with its supports and reserves has been gradual and sure. Hand in hand with comparatively recent changes in infantry has been the increased effective use of cavalry in screening, outpost, and various other duties for which it is so admirably suited, and this tactical growth in both infantry and cavalry has been brought about in a marked degree by the steady improvements in artillery methods.

To the fact that the Prussians not only foresaw the necessity for tactical changes, but in time of peace worked out new methods, actually adopted them, and put them into operation, must be attributed their overwhelming and decisive victories. In the Austro-Prussian War the contest was to some extent unequal on account of muzzle-loaders on one side and breech-loaders on the other; but in the Franco German War the "Chassepot" was superior to the "Needle-gun" in range, accuracy and rapidity of fire, yet the Prussians again won. The facts in the latter case are that the French were particularly at fault in not having a more clearly defined tactical system, better suited to the then modern conditions. The Germans had more carefully studied the lessons of the American struggle, had adopted the tactical methods suggested by recent improvements, and by their familiarity with the subject were able, during the progress of a spirited campaign,* to devise new battle tactics which caused the terrible fire of the French to be much less destructive. Ever since the Napoleonic wars the theory of French tactics had been one thing and the practice quite another. They rested in fancied security on a sort of race prejudice, a thing not altogether peculiar to France. It was another beautiful illustration of the hare and the tortoise and was a rude awakening for the French.

This war, and other smaller engagements later on, gave renewed impetus to the idea of attenuated lines and extended order with its system of supports and reserves as a means of avoiding the disastrous effects of modern fire. But the question that is now beginning to agitate thinking and observant military students is whether the pendulum whose swing was started in this direction by Gustavus Adolphus and Frederick the Great has not already gone too far. Must we not return to some more tenable middle ground and, if necessary, introduce some new tactical factor to overcome the existing difficulties?

Almost every writer on this subject, almost every officer of experience and nearly every military student, either states outright or allows it to be understood that modern tactical methods for infantry are at least insecure if not entirely impracticable. This is believed to be true of all infantry tactics at the present time, Germany's not excepted. It is to be presumed that, when our own infantry tactics were remodelled by officers who were experienced, liberal minded and progressive, all existing

* St. Privat and following.

methods were thoroughly investigated, and that our tactics can safely be taken as a fair representative of the most modern ideas and developments. But let any well-informed officer, either with or without actual battle experience, observe a battalion of our infantry forming for and moving forward in attack. No matter with what precision the lines laid down in the drill-book be carried out, can that officer help wishing that he had a company at the objective point with which to overthrow the combination? Is there any officer who does not believe that with good discipline and plenty of ammunition he could more than hold his own?

While it is not intended in this paper to make a detailed criticism of modern infantry battle tactics, a few of the most apparent defects must for our purpose be noted:

1. Only from one-third to one-half the men under galling fire are in a position to return that fire.

2. The men of any one organization actually firing are so extended as to render control difficult if not impossible even on the drill ground, and this defect is felt much more keenly when attempting to work out problems in minor tactics.

3. The firing line, supports and reserves are too scattered to be under the immediate direction of any one officer. If these defects are so apparent in a battalion of four half-size companies on drill, what can be expected in large commands and in more complicated engagements?

4. The officers are scattered quite as badly as the men, and, without that complete understanding which is often impracticable and sometimes impossible, the lieutenants cannot always grasp what the captain desires, and it appears also that the captains frequently fail to comprehend what is desired of them by the major.

5. If in battle the captain himself feels the need of a close and constant support on the part of his lieutenants, what will be the condition of the non-commissioned officer and the private when the physical and moral support of his officers on which, despite our best efforts at training, he is and ever must be so dependent, is withdrawn? With the three officers allowed to the present company there are none too many, but what will happen when the company contains a hundred rifles and when the captain commands the regiment and the 2d lieutenant of firing line fame commands the company? It is a beautiful theory, this of making "the man behind the gun" independent, or only depen-

dent on his neighbor in the ranks ; but have we ever had or can we ever get such men in the ranks ? This independence might possibly be hoped for in the case of carefully and continuously drilled regulars, few really expect it ; in case of volunteers and militia we know it cannot even be hoped for until after they have become veteran troops by two or three serious engagements and everything now points to the fact that two or three contests will practically settle any future war. The tactical handling of infantry to-day is not only a puzzling question, but a painful one ; too many officers of both high and low rank seem disinclined to look the facts squarely in the face. Recapitulated, the difficulties may be stated as follows :

Lines, in order to withstand the expected fire, are extended and separated until control, unity of action is lost ; a majority of the men under fire cannot return that fire ; and the firing line is too weak per unit of length to accomplish the desired object when it does, if ever, come within striking distance. The result will be, say officers of experience and foresight, that the supports and reserves will rush on to the first line, it being an observed fact that men instinctively go toward the fire that affects them ; that they will get there early in the engagement, but without orders, in a confused, irregular mass ; and with no one there competent to give either example or orders. When it is asked—"Why not give these men the ultimate formation from the beginning but make it regular, strong enough and dirigible?" the answer is, that such a formation would be annihilated by the enemy's fire on account of the length of time necessary to cover the required distance. Choose your own horn of the dilemma ; one seems quite as bad as the other.

Artillery, from its smaller numbers, more definite objects, more mechanical duties, better organization, greater comparative number of officers ; from the distinct nucleus which its guns form for the men, and possibly from the more scientific methods used by its officers, is not in such a bad way tactically.

Cavalry, for many of the above reasons, which are only hinted at, and for the additional reasons that it is seldom under long continued fire, and that whatever is done is accomplished with a rush and under circumstances calculated to bolster up physical and moral courage, seems also to have fairly appropriate tactical methods.

But has the infantry which is to bear the scorching of well

directed and continuous artillery and infantry fire, and the unexpected crush of the cavalry charge; which carries its own impedimenta, its own ammunition, and often with the fear that this is its only supply, which is to be used like the quartermaster's department, for "all other purposes"; which when, in the firing line moving from cover to cover, must be mindful that projectiles whizzing noisily if harmlessly by will find their mission in cutting down the exposed reserves upon whom its own safety and the final victory or defeat depends; has the infantry such organization and tactics as to assure it in the bloody trial? Is it not a fact, a fact not much written about to be sure, but admitted by old and experienced officers, that, while the artillery has a well planned and often secure position, a definite object to perform in a carefully detailed manner; while the cavalry is properly preserved in chosen places until the "critical" moment of its "usefulness"; is it not too often the fact that infantry is brought on the field with only a modicum of forethought and preparation, and that after the battle is once fairly under way about the only tactics known is,— "Go in boys, go in and win"? They do "go in", and they go through too; they come out sometimes roughly handled, but ever ready to "go in" again. If victorious, is it not more often good luck than good tactics?

In this connection I wish to quote from the annual report of the Inspector-General to the Lieutenant-General commanding the army, for the year 1895, which has been received since the completion of this essay. Beginning with the last complete paragraph, page 13, we read:

"In concluding this portion of my report, it is incumbent upon me to say that so far as my experience enables me to form a just judgment the system of extended order drill exercises, as prescribed in our drill regulations, does not give promise of good results when brought into play in face of an enterprising enemy. Even on the drill field there is a want of coincidence and harmony of action that is disconcerting and confusing, and I think some simpler method that insures unity of action should be diligently sought. * * *

"In a month after a campaign actually opens, the company will, judging from well-established historical experiences, fall to between sixty and eighty men. This is too small a unit to operate with in the manner prescribed in our drill regulations. Their exertions would be expended in weak attacks, without coinci-

dence of effort, and would invite defeat; whereas heavy blows, well combined, promise success. Now, with companies so small that independent efforts are unwarranted, we must look for some other method. In studying this problem I have convinced myself that the safest course for us to pursue, national politics and army officers both considered, is to restrict our companies to such a number as can be well managed by company officers and make a combination of these companies for the working unit. In other words, take the battalion of four companies as the unit in battle, and have this unit directed by a chief and staff. This in all probability would eventually lead to the formation of regiments of four battalions each, but that would be a matter for future consideration. The necessity now is to obtain a system of drill that can be made applicable under fire."

This is strong language for a report of this character, and, coming from such an authority, it must be accepted as a fact, and furthermore, as a fact stated in about its mildest form.

Accepting this state of affairs as a fact the next thing to do is to act.

Why is infantry thus handicapped? The best military minds in all ages have given this subject the most careful thought. It is simply because this is the broadest and deepest of all military subjects, the first to be affected by any change, the one calling for the most diverse expedients, and the one which will always present new phases; a subject that in reality overtops and embraces all others. The handling of artillery is important and often decisive; cavalry plays a rôle that can be delegated to no other troops; but mastery of the infantry problem is the *sine qua non* of a successful campaign. Consideration of its proper organization and employment opens up such a wide range of possibilities that little more than generalities has ever been attempted.

In discussing any subject it has ever required less ingenuity to tear down than to construct, it is more easy to find fault with given conditions than to suggest rational means of improvement. We are all too ready in pointing out the shortcomings of existing systems under which we find ourselves and too slow in giving them serious thought and honest study with a view to their betterment. Never has there been more urgent need for careful investigation of tactical methods than at present. Burdened as we are with an obsolete organization to which are being adapted, Procrustean like, the most modern experiments in tactics, it is

high time the United States infantry should make some enlightened, concerted attempt to remedy this "new wine in old bottles" condition. We should rightly have great confidence in American infantry and firmly believe that, in case of our becoming engaged in a great war, new battle tactics suited to present conditions would ultimately be evolved which would again be the world's recognized standard for another quarter century. This result would be attained, however, as in 1861-65, by the sacrifice of thousands of lives and millions of treasure. In view of past experience this sacrifice would be culpable negligence. If we are able to solve this problem, how shiftless and selfish of us to rest on our real or fancied capability and not to bestir ourselves until war forces the required activity. We proudly claim to be a "practical" people, and there is good ground for this claim, for where the incentive is great enough, we are to-day solving the world's practical problems. Why not then as infantry officers seriously attempt to settle some of these military questions? Why not be stimulated by professional pride and patriotism rather than to wait for the iron goad of war? We have lazily adopted German methods instead of going back to their data and deducing methods suited to our own needs. Shall we allow that the Germans learned more from our own war than we ourselves? Rather let us take the lessons of the Franco-German War and by adding our own experience and by making allowances for modern improvements deduce our own and possibly better results than the Germans themselves.

Von Scherff ably summarizes the Franco-German War by saying that the enemy's position, no matter what its particular form, "was invariably carried by a swarm of skirmishers, followed only at greater or less distance by lines and columns in close order." This statement is deserving of the deepest study. It is full of significance not only as a radical truth, stated by a competent observer, but especially as giving in a nutshell the tactics of the last great war; a war hardly equalled in decisiveness, completeness of detailed arrangements, and for generalship."

"A swarm of skirmishers" in advance, followed by "lines and columns in close order"; this may well serve as a military text. This is a direct result of carrying Napoleonic methods and methods practiced in our Civil War to their logical conclusion, at the same time making due allowance for intermediate improvements. But Von Scherff thus summarizes a war that occurred

twenty-five years ago when the effective range of the best rifle was but thirteen hundred yards, that of field artillery much less than now, and when rapidity of fire was not to be compared to the present rate. Nearly all the conditions are changed and we are assured again and again that "lines and columns in close order" cannot live under modern battle conditions. To say nothing of improved artillery, modern infantry fire is now effective at over two thousand yards, is murderous at one thousand to twelve hundred yards, and simply annihilating at from three to five hundred yards. The rapidity of fire is limited only by the possible supply of ammunition and by the physical endurance of the soldier.

Starting at two thousand yards it takes infantry over twelve minutes to reach the one thousand yard point and, under the fire that would be brought to bear, it would take infantry at least fifteen minutes more, if not longer, to reach the point from which a charge could be made.

We know that infantry in close order cannot survive twenty to thirty minutes of this expected fire, and that it is a serious question whether infantry in any but the most extended order can make it, if at all. If the order be thus extended, control of the line is lost and when it arrives at charging distance, there is not enough cohesion and weight to accomplish the required object. The supports and reserves cannot be brought up in close order and are subject to the same objections that apply to the first line, if in extended order, with the additional objection that they cannot return the fire that is cutting them down. The first extended line and all subsequent extended lines will go about where they please or where the weight of fire and the character of the ground forces them: the individual soldier is in command, practically every man for himself, and no matter what his state of discipline, each can see and judge of but a small part of the battle conditions.

Typical battle tactics would seem to consist of 1. Throwing forward as strong a line of skirmishers as could live under the particular fire in question, and, when this line shall have reached an advanced position from which effective work can be accomplished, 2. Reinforcing it at special points of attack with fresh troops in the most compact order practicable, which should be close order if possible.

This simple plan immediately appeals to the common sense of

every officer. It is not at all new, for probably four out of every five great battles have been won on this general principle: 1. An advance line to engage the enemy, and 2. Reinforcements thrown in at the proper time at the proper points.

Now, without being unduly overawed by the apparent impossibility of carrying out the second portion of this plan under existing circumstances, let us make a careful study of these two general points, applying modern conditions.

1. This advanced line or "swarm of skirmishers" as Von Scherff calls it, should, in accordance with well-established principles, on which it is unnecessary to dwell here, be composed of entire organizations with their full complement of officers. The company officers must be practically right in the line of skirmishers, for the purpose of encouraging and supporting by their presence quite as much as for giving their personal supervision to every detail. If captains and lieutenants are important in time of peace, then during campaigns and battles they must of necessity be much more important. But while in time of peace the company officers can and should stand somewhat aloof and govern their organizations through the prescribed and customary peace-footing channels, in campaigns and on the battle-field they must be component parts of their commands, in actual close contact with their men, controlling and directing by example as well as by precept, instead of governing from a distance. In garrisons, captains and lieutenants are rightly shown great consideration and are quite important personages individually, but in war they must be considered simply as necessary adjuncts of such and such a company, and cannot be considered personally or individually or apart from their company. The company can and should be made the reflection of its officers and each subaltern should have a part to fulfill, as is wisely made obligatory on the company commander by par. 255, A. R., 1895; hence, also, the greater necessity of the company being kept well together and the company officers being immediately in rear of their companies, instead of the company being widely scattered and the officers being from fifteen to one hundred yards away. This in turn gives the major better control and if he cannot properly direct the action of four full strength companies, he should be given but two or at most three. The major, again, being more or less a component part of his battalion and governing by his personality as well as by his orders, must be closely in rear of his command in order to have

complete control of it, and in action must of course be dismounted. A two or four battalion organization would seem best suited for this purpose and if there are four battalions, a lieutenant-colonel should command each wing. By the same reasoning the lieutenant colonels and commander of the regiment should not be very far behind the line of majors. The failure to keep a full number of officers with a regiment during a campaign is generally due to shiftless methods rather than to lack of material and is extremely poor economy. If a full complement of officers is ever needed it is especially imperative in actual battle. In short, to fulfill the first part of the proposition, if the advanced line has to be less dense, send forward a less number of organizations, but have each complete as far as it goes and intact, just as they are on the march and in camp, habitually; then will be realized the full force of their discipline and *esprit de corps*. On the other hand our present formation gives an appearance of, if not in reality an encouragement to, a sort of straggling or shirking of duty and leaves too much to be expected and demanded of the individual officer or man. Drills and marches and campaigns are frequent (though perhaps not enough so) compared with battles; therefore the more reason men should have the same formation in the supreme trial for which they are being educated by years of discipline, that they have in the routine of every-day life.

2. Admit, for argument's sake, that fresh troops in close order cannot be brought up to reinforce the above described line on account of the time required to cover the distance to be marched. Admit that under present conditions the time these supporting and reserve forces would have to be under fire would be long enough for their demoralization if not annihilation. What is the crucial point of the objection? *Time under fire*. Since we cannot hope to sufficiently reduce the enemy's fire by our own, *time* is the matter on which the whole question hinges; hence *time* is the Gordian knot which must be cut. Common sense would suggest that as we cannot materially reduce the enemy's *fire*, we reduce our own *time*. That is the only logical conclusion. There seems but one way to accomplish this object, viz., to *mount* the supporting and reserve *infantry*.

This, it is believed, will make possible the second part of our general proposition.

Mounted infantry has been used in cases of necessity, for special purposes and in limited numbers on numerous occasions

and over a considerable period of time. The English, and perhaps some other nations, have made a start at its permanent organization. But nothing, so far as I can find out, has been attempted, or indeed foreseen, on the scale herewith submitted.

It is not thought necessary, on account of its previous and present limited uses, to go into a detailed discussion of the existing organization and tactics of mounted infantry; it makes up a very small part of the present battle tactics. In future, however, from our point of view, mounted infantry must form the bulk of the army and be the main reliance of the commander.

Speaking of mounted infantry, Shaw says: "The advantages of a force of this character being made a part of our field army will sooner or later be acknowledged, but the functions of the force must be clearly understood before its value can be fully realized." Of these functions Shaw only mentions two, viz.: 1. To enable infantry to act with cavalry, and 2. To perform certain duties in the absence of cavalry. These two functions when closely considered, mean one and the same thing, and that is, to utilize mounted infantry for cavalry purposes. This idea is not to be entertained for a moment. If any army has not enough cavalry to properly perform its special work, its cavalry should be increased, which, however, is not the point being argued here. Neither the infantry nor the cavalry should be handicapped with such a proposition. This would be poor economy, for it would probably result in spoiling good infantry to make but indifferent cavalry.

Infantry does not need to be mounted because it is disinclined or unable to march; history teaches us that. But infantry in support and reserve does need to be mounted simply and solely that it may be brought to an advanced position, already partially held, in eight or ten minutes time instead of twenty or thirty minutes. This seems to be the main, and an amply sufficient reason, for mounting the infantry. Time and trial will probably be required to substantiate the truth and feasibility of this proposition; in the meantime its reasonableness may be discussed.

Shaw further states that "As soon as the advantages are felt by commanders, of the rifle being well to the front in all field operations, means will, no doubt, be improvised during the campaign for moving infantry quickly," and he very pertinently adds: "But it is better to consider these matters in advance in time of peace, to avoid necessity for shifts and expedients in time of war."

It may not be necessary to mount all the infantry, two divisions to the corps might suffice; this, however, is a matter for later consideration. Take an army corps and consider the twenty thousand (more or less) infantry composing it. Mount this infantry on small, strong, enduring and docile pony horses. This horse is so gaited as to make five or six miles per hour, which means thirty to thirty-five miles per day, for long continued periods. Do not attempt to make cavalry of this force, but simply teach it to use the ponies as transportation for the men, their arms, ammunition and equipments. The only mounted drill to be taught is to ride in column or in line and to dismount and form in front.

While more or less closely identified with the command of thirty Apache Indian scouts for a good part of three years, I attempted to teach them nothing more in the way of mounted drill. Their ponies, selected under careful supervision, are almost the typical animals for mounted infantry. They will carry an ordinary rider over very rough ground at the pace above mentioned and I have repeatedly charged the detachment over country ordinarily considered impossible, without injury to either scout or pony. These scouts were mounted infantry pure and simple, and after charging a distance of a thousand yards could halt and form line to the front at command in an incredibly short space of time, the ponies being turned over to scouts, who remained mounted, at the rate of ten ponies to each scout, these took the herd to the rear, over the same ground and at the same gait as they had advanced, viz.,—about one thousand yards in six minutes.

There need be no confusion while dismounting and forming line and the ponies very soon learn what is wanted of them. Any company of infantry can be taught the same thing much better, for the Apache Indian is not a natural rider but a footman. It is thought that *battalions* of mounted infantry in support and reserve can be thus brought into action without difficulty, and that by this means the advanced line can be reinforced at desired points in an effective manner.

Of course somebody is going to be hit during this six or eight minutes ride to the front, but after the men are at the front, they are fresh for the work, in good order, elated with the rush and eager for fight.

During this reinforcement, the charging mounted infantry is bound to monopolize the attention of the enemy so that the first

line will be free to advance and pour in an unopposed rapid fire of such a character as will materially check, if not altogether disconcert the fire of the enemy who, having to fire at an objective whose distance from them is rapidly changing, will be able to accomplish only a fraction of the damage that would result to slowly moving foot troops for the same period of time.

Battalion after battalion can be thrown forward in this manner with minimum loss and the infantry be placed exactly where they are required, and at the critical moment. These fresh troops will arrive at the advanced position with plenty of nerve, without fatigue, with plenty of ammunition and without being demoralized by their losses, however serious they may be. Men do not heed casualties under such circumstances.

Consider for a moment the *morale* of troops in the advanced line when they know that they are being supported by such troops, when they know that at the right time and in the right places they are to be reinforced in such a manner that it will give them the highest possible percentage of chances to win. Consider, also the spirit aroused in troops thus called upon to succor their comrades of the advanced line. Does not this plan bring to the front all that is held highest and noblest by the soldier? Can you imagine any conditions under which men will fight better?

Imagine an army, behind its cavalry screen and its advanced guards, that has at last manœuvred the enemy into a position where, from inferiority of numbers, lack of supplies, protection of base, or any other reasons, it must act on the defensive. The cavalry has fallen away to the right and left to protect the flanks, the advanced guards have reconnoitred, sent their last information to the general, and taken up such positions as to cover the army and force the enemy to develop its defense. The leading divisions of infantry dismount as soon as they come under fire and the leading artillery begins ranging for the enemy and to take position for the battle. The leading divisions move forward on foot, accompanied as closely as is practicable by their mounts, until compelled by the enemy's fire to extend, and in the meantime the reserve artillery comes up and enters into its share of the fight, advancing according to its present tactics for the various stages of a battle. The commanding general by means of the reports received, balloon observations and so forth, has knowledge of the exact position and strength of the enemy, and by means of field telegraph and other signal corps appliances, is in

constant communication with his batteries, the supporting and reserve infantry and the cavalry. The advanced line from the leading divisions, meanwhile, is working its way to the front under such cover as can be found and the artillery duel is in full blast. The reserve infantry, mounted, and such cavalry as is available for this purpose, is favorably posted for supporting the attack and under cover of the artillery fire, and that of the advanced line can probably work up to within ten or twelve hundred yards without serious loss or inconvenience. If the artillery is sufficiently in force, advantageously posted and is properly performing its part, the enemy's fire is somewhat under control and the "swarm of skirmishers" is working well up to the assaulting position.

The general now understands, by the developed fire and the extent of the enemy's lines, where the feints and where the main attack or attacks should be made, and notifies his subordinate commanders where and when to throw in their divisions and brigades. The mounted infantry supports move out at command and drawing the enemy's fire from the advanced line, the latter prepares for rapid fire and the final struggle. Now is the grand trial. Battalions, brigades, divisions are whirled to the front at a gallop along such portions of the line as it is desired to reinforce, and arriving at the advanced line after a thousand yards' dash, lands on its feet and the enemy is charged.

While the entire battle has lasted for some time, the critical period, during which the entire forces have been in action and under fire, is over in eight or ten minutes. During this crisis terrific slaughter will take place, but not more and probably not as great as suffered in former battles and under former conditions.

The true infantry reserves are in such position as, with the cavalry and reserve artillery, to cover the retreat in case of defeat or to quickly take advantage of victory in case one is gained.

Briefly stated again, the idea is as follows:

Take Von Scherff's summation of the Franco-German War as an established fact, viz.: that their battles were won, and under the nearest to present conditions that we have seen tried, by "a swarm of skirmishers" followed by "lines and columns in close order." From that and other general data deduce the typical and common sense method of sending forward as strong an advanced line as the ground and the character of the fire will permit, reinforcing this line at proper points by sending mounted infantry quickly to the front.

This plan admits of all the varieties of attack and offensive defense, being especially adapted to flank and turning movements. Is it or is it not a reasonable plan, whereby under present conditions a sufficient force can be gotten within striking distance of the enemy's position? Does it in any way suggest the solution of, or materially modify the problem of how to get over the terrible "last five hundred yards" at which all other systems apparently stumble? Does it not also practically solve the "supply of ammunition" problem, and materially modify the question of manœuvring and concentrating troops? No plan is to be lightly cast aside because it is new, nor because submitted by a junior. This seems a bold scheme and a radical change, but the radical changes in conditions demand radical methods. The battle proper will be won or lost in a short space of time and consequently every move must be well planned, without hesitation, fearless and decisive.

From lack of time and from some little respect for the proper limit of a lyceum paper, no especial attention has been given to the possibilities of this system in defensive operations, but it is believed to be worthy of serious consideration and development.

In the above briefly and imperfectly outlined system one of the first considerations is the infantry mount. These pony horses should be specially reared on parts of the public domain set aside for that purpose, and bred from carefully selected animals with reference to endurance and docility (teachableness). This style of horse is not selected as a cheap expedient but because such pony horses come nearer to fulfilling all the requirements of an infantry mount than any other. After being assigned to the company and battalion they should have frequent, indeed daily drills, each drill concluding with the charge and dismount, after which the animals should invariably be herded to the rear at the same gait and over the exact ground covered during the advance. Regular systematic training and drill will do as much for the horse as for the soldier.

Of apparent objections to this organization, one of the first to strike the military student is the question of forage. During peace this comes under the head of cost of maintenance, but during campaigns it has an important bearing on transportation. Army trains are already large and the proper supply of an army in the field is a problem of such magnitude as to require special consideration which cannot be given here. It can be

noted here, however, and urged for further consideration, that railroad facilities have increased so enormously since our last wars, and were made so much of during those wars that the problem is in reality more simple than at first glance appears. There is now hardly a section of any great extent in civilized countries which is not well served by existing railroads, and both commercial and military railroads are constantly being added to the present systems. These must and will be utilized to the fullest extent possible in future wars. No force can guard and repair them to greater advantage than this same mounted infantry. Then, too, these infantry mounts will require only about half as much forage per animal as is used by the present cavalry mounts. The ponies themselves will carry much of the ammunition and impedimenta that now have to be transported by wagon, thus tending, in this particular case, to lessen the size of trains and to greatly simplify the important and puzzling questions of supplying the lines with ammunition and taking care of the wounded. Moreover, while emergency rations are being considered for the soldier it might be well to also look for suitable forage in a condensed form.

A second objection will be the lengthening out of marching columns due to having troops on horseback instead of on foot. When it is remembered, however, that these ponies travel without difficulty over ground where foot troops could proceed but slowly, if at all, and that, in consequence, mounted infantry could march in a greater number of parallel columns, practically independent of roads, this objection almost disappears.

Original cost and expense of maintenance is another objection. These horses are cheap and will undoubtedly be cheaper. Suitable mounts could now be purchased for from ten to twenty dollars each, and if the Government should take hold of the matter properly, utilizing some of the "Wards of the Nation" which are now giving it considerable anxiety and expense, the cost of these mounts might, it is thought, be considerably reduced and at the same time present an additional factor in the solution of the Indian question. Forage is also becoming less expensive as the place of the horse is being filled by other means, and in the form of grain-hay,* etc., can be produced to advantage where other crops now pay but poorly.

* Wheat, barley or oats cut just before it is ripe : a good combination of long and short forage.

Other objections and, it is hoped, other advantages, will arise, not mentioned in this paper and possibly not now foreseen. But again it must be remembered that all other necessities must give way, all obstacles must go down before the dire necessities and demands of war. It is believed that the bicycle will be brought in to help and perhaps to somewhat modify this system, although to what extent cannot now be easily foretold. Bicycle corps are mounted infantry in the best sense of the term, and where they can be used, and the limits of their functions is being rapidly and, it is hoped, satisfactorily determined.

This review of the present situation does not pretend to be exhaustive, and the expedients set forth to meet the changed and still changing conditions have not, for lack of time and data, been considered with that attention to details which the subject warrants. The attempt is made to but roughly indicate a suitable organization and its required tactics for getting the infantry supports and reserves over the deadly space between twelve hundred and one hundred yards, in good order, in the minimum time and without annihilation or demoralization, barely pointing out a few of its tactical possibilities with reference to the great infantry problem. Crude as they are, however, these ideas are set forth with a firm belief in their necessity, utility and practicability, and with the hope that intelligent discussion may be healthfully stimulated in this direction and perhaps ultimate advantage derived.

As long as there shall be a scientific profession of arms, one of its main duties may be summed up in the dictum, "In time of peace prepare for war." Many agree that this mania for preparation has already gone too far; its constantly increasing burdens are now more than ever before being felt and considered by the peoples of many nations. But as long as the belief exists that future wars between civilized powers are inevitable, just so long must these burdens be borne; and they must increase in about the same ratio as new developments in arms and armament increase.

If the whole system shall at last fall to the ground of its own weight, no class will hail that epoch with greater satisfaction than the true professional soldier.

ARTILLERY FIRING CHARTS.

BY FIRST LIEUT. H. A. REED, 2D U. S. ARTILLERY.

IN August, 1896, at Sandy Hook, N. J., I was in immediate charge of the preparation of an artillery firing chart for use by the artillery battalions during the ensuing month. In preceding years I had made several of these charts for use in target practice at different posts; but, in their construction, prevailing methods of copying, compiling and consequent inattention to strict accuracy were followed and attached to the work; however, they were probably as accurate as were many of the observations taken of targets and splashes of projectiles during the corresponding practice. But, for the Sandy Hook practice of 1896, some of the largest and best guns in the service were to be used, the ranges far exceeded those hitherto fired over, and it was necessary that a chart, for this occasion, at least, should not be wanting in accuracy or found inconvenient in use.

Two officers and four enlisted men were employed in the work. The time allowed before the arrival of the first battalion for practice was 26 working days. The temperature at first was excessively high and, on account of haze and fog, but few days permitted of observations from the most distant stations.

The work was greatly expedited by the adoption of a side of a U. S. C. & G. Survey triangle for the base of the triangulation. Its azimuth, length and terminal stations were given on a tracing from the original map, furnished by the C. S. Bureau on application made by the C. O. of the first battalion under whose direction the chart was made.

The field work began by the occupation of these terminal stations, and transit measurements of the angles between the base as a side and lines to all points likely to be used in the triangulation; and was extended to occupation of the selected points, and the direct measurement of all the angles of each of the triangles. There was no indirect measurement, such as, for instance, determining a third angle by subtracting two measured ones from 180° . Each angle was measured at least twenty times and some of the angles sixty times. The maximum error in the closing of a tri-

angle was 8 seconds,—inappreciable with the scale used. The triangulation closed on a measured base.

The subsequent office work was lessened by sighting, in the field work, on signals erected at the instrument stations, at the plumb-bob point, thus obviating the use of formulæ for reduction to centre of station.

The triangulation adjusted, the angles and their tangents tabulated and the scale, 1-7200, selected, the survey was then plotted in pencil on the cloth-backed paper in common use at army posts. It was found impracticable to stretch this paper tightly enough to produce a perfectly plane surface, so unbacked paper stretched while moist would have been better. The middle point of the paper determined, two right lines intersecting at this point were accurately constructed at right angles to each other,—one approximately parallel to the longer edge of the paper,—to serve as axes or base lines for all construction measurements. Each of these axes was divided into 2-inch parts beginning at the middle point,—the beam compass being first used to set off multiples of these parts, conveniently near the edges of the paper, to serve as checks in spacing. Very fine right lines were then drawn through the points of division, thus subdividing the sheet into 2-inch squares. Single squares and groups of squares were then checked by diagonals and errors corrected. As the targets were to be on the water, the land representation was so disposed as to give as large a field of fire on the water as possible, and so that the observing stations would command this field. Angles were plotted by tangents of 1000 yards radius,—the circular protractors issued to posts being of course too inaccurate for the purpose.

It was decided that true azimuths instead of "base angles" should be used in the target practice. To facilitate this, four arc-scales were constructed with radius of about 40 inches, and the two observing stations and middle points of the two batteries, from which the firing was to take place, as centres. To graduate each of these azimuth measuring arcs accurately, it was produced to include a quadrant having one extremity at the south; this was spaced into ninety equal parts, each of these into ten equal parts and the subdivision continued until 5-minute arcs resulted, which were about 1-16th of an inch in length; so single minutes could easily be estimated; and one minute at the extreme range prescribed—8000 yards—corresponded to but 2 and 1-3 yards. This subdivision was checked by comparing diagonals of groups

of equal numbers of subdivisions. Each arc was designated by the initial letter of the station used as its centre,—in large type and conspicuously placed near its middle point, so as to quickly attract attention in the hurry of practice. The whole-degree divisions were numbered. As there was an azimuth arc for each battery, either one of the corresponding centres could be used as a third observing station as a check for accuracy.

The 2-inch squares in that part of the chart containing the field of fire were subdivided into 1-inch squares, and the penciling was then inked and marginal numbers added in accord with existing orders. Silk threads pivoted to needles at the station points, and lead weights covered with silk of different colors, were used in marking the lines of direction as observed at and transmitted from the stations,—a piece of rubber band being introduced in each thread to prevent disturbing the needle to which it was attached.

For measuring ranges with the steel rule, the large opening at the pivot was filled with wood and a needle thrust through it, for use instead of the coarse plug which is issued with it.

In the foregoing description may be noted some departures from the method employed at most posts in the preparation of an artillery chart for target practice, but there is of course much room for improvement.

G. O. 108, A. G. O. '88 was issued when the 8" C. R. was our longest range sea-coast gun. Three miles from the battery was the lowest limit of the chart field and the scale prescribed was 1-3600, or 100 yards to an inch. Now this limit, for an all around fire, as at Fort Warren, or Alcatraz, would require the chart to be about 9 feet square, or a circle of 53" radius. It is readily seen that a chart of this size is altogether too large to work over conveniently,—to lean over and make adjustments, or measurements, at or near the centre. Of course for a narrow field it might serve, and the larger the scale the greater the accuracy; but for a range of 5 miles and the resulting map, nearly 15 feet square, the scale prescribed in existing orders is evidently impracticable.

These orders require that the base lines used in artillery target practice shall be plotted on the post chart, which is also to show the soundings within range of the guns, and the shoals, reefs, islands, light-houses, beacons, etc., which may be useful in quickly determining distances; hence the post chart is not in-

tended for target practice alone, but is evidently to serve for the accurate location of every fixed and movable object within range of the post batteries. A chart with prescribed scale conforming to these conditions for Fort Schuyler armed with the 10" B. R. gun, would be 28 feet in length, or over 15 feet, if the fire was to be but in one direction. For target practice only, a narrow strip containing base line and target, with a sector large enough to show deviations, stretched on the floor of a large room might be handled, but the work would hardly be considered of a rational character.

Evidently the scale must be reduced and very much so for target practice work.

The Sandy Hook chart constructed to a scale of 1-7200, or one half the prescribed scale, limited the field of fire to the S. W. quadrant; and its border dimensions were about 50×60 inches,—just about the maximum size to work over conveniently.

The choice of a suitable scale for firing charts is apparently of considerable importance. 1-10,800 gives 300 yards to an inch, and a 60th of an inch division, which is quite easily read, gives 5 yards,—about the tangent of 1 minute for a ten mile radius. This scale, or one of 400 yards to the inch, which would work better with the steel rule now on hand, seems about right for our new long range guns. The chart used with the Lewis range-finder, for long ranges, is 400 yards to an inch.

I am informed that a system of polar coördinates for plotting shots, etc., has been very recently approved by the Secretary of War, but the order for its introduction has not yet been issued; so the triangulation method being still in force, there are some suggestions concerning it that might prove useful.

True azimuth measurements afford many advantages. The true azimuth of a point given, an approximate idea of its direction is at once communicated to any one knowing the points of the compass. There is no confusion resulting in choosing the right direction or the side of the datum line on which to lay off the angle; *e. g.*,—with base angle measurements, which are still in use at some posts, the numerical value of the angle must be preceded by the proper sign to insure its correct plotting. This cannot happen with true azimuth angles because they are always measured around to the right, and no sign or explanatory note is required. Besides the U. S. C. Survey triangulation is

based on this method, and a tracing received from them becomes immediately available for the purpose required.

It is generally conceded that silk or fine wire threads used in conjunction with arcs of much greater radii than those of the metal protractor give the most accurate results in plotting of the various schemes extant. Now the construction of these arcs on the chart is a very nice operation, requiring much time and labor; and it is necessary to make new ones whenever the centres of observation are changed; besides, the effect of heat and moisture is to warp the chart and otherwise vitiate its accuracy. To obviate these difficulties it is proposed that three metal azimuth arcs,—one for each observing station and one for the gun,—be furnished for each plotting board. The base, gun and line of fire having been represented on the board and the required azimuths known, the arcs are placed in position and secured either by tacks, screws, or by pressing points projecting from their lower surfaces into the board, the silk threads are then used as is customary in measuring the angles. The arcs may be 1 ft. long, $\frac{1}{2}$ an inch broad and 1-20th of an inch thick. This length with a 34.48" radius would give about 10° on each side of the line of observation, sufficient for deviations in the wildest shooting; and subdivisions of 1-50th of an inch would give 2' readings, from which 1' could be estimated. The degree divisions are not numbered, and the arcs are placed as follows: *e. g.*, at "A," to measure shot angles:—draw a N. & S. line through "A"; describe from "A" as a centre, with metal arc radius, a pencil arc; place the metal arc on the penciled arc so that a minute reading near its middle point will correspond with the observed azimuth of the target; then, on a slip of paper secured along the edge of the metal arc, or with pen and ink on the metal surface, number the degree divisions accordingly. Do the same for station "B" and the gun, and there results an accurate and expeditiously prepared means for angle measurements.

The thick steel rule now supplied for measuring ranges is unwieldy, obstructs other measurements and is often too short. In its stead I would suggest either a very much thinner rule or a steel tape graduated as now to read hundreds of yards, according to the scale used, with subdivisions to read as low at least as 5 yards; to be not less than 4 feet in length, and capable of being pivoted to a needle, not a plug, through its centre at the gun. A sliding deviation scale seems cumbersome and unnecessary. As

deviations are distances measured perpendicularly to the line of fire at the target, draw this perpendicular once for all; dot its crossing by the silk thread used to give the gun azimuth of the shot, and apply a pair of dividers. Any differences due to movement of the target can be as readily determined this way as by any other known to the writer and at least as rapidly and accurately.

The lateral deviation would be more rationally defined by a chord of the arc described with gun as centre and passing through the target, this chord having one extremity in the target and the other at the intersection of silk thread with this arc. The shot is presumed to hit the target, so far as range is concerned, when it reaches this arc; so the measurement of the lateral deviation is the direct distance from target to intersection. Or, from another point of view, a lateral deviation necessitating correction in the next pointing of the gun, if this is given in azimuth to the gunner and there is an azimuth scale attached to the gun platform, the additional scale on the chart heretofore described enables this correction to be made immediately; but if lineal measurement of lateral deviation is demanded, and it is required for the record, then the prescribed way of measuring it needs to be changed; for it is apparent that if measured perpendicularly to the target line of fire, it is too great, and perpendicularly to the shot line of fire, too little: to be accurate, it should be measured by the chord above described.

THE FIELD OUTFIT OF AN INFANTRYMAN.

BY LIEUT. JAMES RONAYNE, 19TH U. S. INFANTRY.

AMONG the necessities of every-day life man, in general, finds food and clothing; and the day has long since passed when he depended for success in strife on Nature's weapons alone. The soldier, the professional and most successful peacemaker, finds food and clothing just as necessary as the ordinary man and, strange as it may appear, his success as a peacemaker depends in no small degree upon his capability to use to the best advantage instruments of strife of the most destructive nature.

In the earliest stages of civilization the army and the tribe or nation were identical: every man was a warrior and the women and children accompanied the expeditions to prepare and carry food and do such other work as they were fitted for. As civilization advanced the women, children and old men remained at home to watch the herds and till the fields while the young men grouped themselves under their chiefs for war. But as population and industry increased a division of labor became necessary, and in the earlier stages of our civilization, and as a result of its imperfectness, the division of fighting men was the most important. Egypt, possessing the oldest recorded civilization, is the first country which we find providing for an army. By its earliest laws the revenues of the state were divided into three equal parts, one of which went to the king, one to the priests and one to the warriors. Sesostris, the great military organizer of that country, effected his conquest of the then known world, according to the historians, by an army composed of 600,000 infantry, 24,000 cavalry and 27,000 war-chariots. The armies of the Assyrians and Babylonians, the successive conquerors of Egypt and the successive holders of the supremacy of the world, consisted, like that of the Egyptians, principally of infantry. With the advent of Persia as a nation, seeking and finally obtaining supremacy over the others, a marked change in the composition of armies appeared—the Persian army consisted, at first, mainly of cavalry. The race and training of these warriors had perhaps as much to

do with their success as the mobility which their army organization afforded. And we see when later the sturdy Greek, with an army consisting almost entirely of infantry, appears upon the scene what an easy work is the overthrow of the once great Persian empire. Alexander, the Macedonian, who is reckoned to-day among the great captains of the world, had an army of which about one-seventh was cavalry. The Roman legions, to which the Macedonian phalanx had to give way, had a proportion of one-tenth cavalry. The fall of Rome resulted in the rise of the feudal system throughout Europe and under this system we find the proportion of cavalry still less. The great preponderance in the matter of equipment given this arm during this period suffered a blow from which it has never since recovered when the Swiss infantry, in the three successive battles of Granson, Morat and Nancy, near the close of the 15th century, defeated the Burgundian chivalry.

When troops begin to fight behind defenses, whether intrenched camps or walled cities, the importance of artillery as a means of breaking down these obstacles and preparing for the advance of infantry appeared; and in the Old Testament we find mention of "engines invented by cunning men to shoot arrows and great stones." The Romans used the *catapulta balista* and battering ram, but until gunpowder became of general application in the art of war we do not find any trace of an artillery organization. Edward III. in 1344 formed an artillery train and an ordnance establishment numbering 340 men, the first of its kind of which we have any record. The guns were very crude and used chiefly in sieges. Some progress in their construction was made during the 15th century, and Charles VIII. of France used them successfully in his Italian campaigns toward the end of that century. Chesney, speaking about the defeat of the Swiss in 1515, says: "The French artillery played a new and distinguished part, not only by protecting the centre of the army from the charges of the Swiss phalanxes and causing them excessive loss, but also by rapidly taking up such positions from time to time during the battle as enabled the guns to play upon the flanks of the attacking columns." Since that time this branch has made wonderful progress in its equipment; it may be said to have out-classed the other branches; certainly it has the cavalry, which when fought as such to-day possesses in its equipment very few advantages over the Persian cavalry of centuries ago. Still the

rôle of artillery in battle has not changed : the French artillery in 1515 paved the way for the successes of the French infantry, and the most ardent artillerist of to-day will not claim that his arm can do any more.

Up to the present the imagination of any military writer has been unable to picture a period, or condition of affairs, when wars will not be waged principally by infantry. Both artillery and cavalry are powerful auxiliaries when properly employed : they are at times necessary for success, but the main reliance must be placed on infantry at all times. The field outfit, or, in other words, the working clothes of the unit which in the aggregate effects such wonderful changes in the political history of mankind is, therefore, a subject well worth consideration.

As in garrison, the infantryman in the field requires food, clothing (including shelter) and means of offense and defense.

MEANS OF OFFENSE AND DEFENSE.

We place the latter as first in importance. It is the necessity of the soldier. He may trust to chance occasionally, with fair prospect of success, for food, shelter and even clothing, because these are common necessities and the laws of war will uphold their confiscation to his use if such a proceeding be necessary ; but the means of offense and defense must never be left to chance. At present these include rifle, ammunition, bayonet and some form of intrenching tool. The rifle and ammunition are so closely connected as not to admit of separate discussion. Rapidity with accuracy, long range, and flatness of trajectory, and the least possible weight of rifle and cartridge consistent with these qualities form the essentials of a military small-arm and its ammunition. After a test of over fifty different rifles the United States finally adopted the Krag-Jorgensen model, with some modifications, as the arm for its infantry soldiers, and it is now issued to them as the U. S. Magazine Rifle. One season's test on the target range has convinced most of us that the desirable qualities above stated are possessed by this gun to a considerable extent ; to my mind, to such an extent that further improvements in a single-loader gun cannot easily be made. I have intentionally overlooked the imperfections of the sight, because they are so evident that I expect to see a new one issued very soon. We did not test, during last year's target practice, how the magazine feature of the gun would add to that quality to which end it was intended,

viz.: rapidity, or rather, rapidity with accuracy, as the former without the latter is a serious detriment resulting in the waste of valuable ammunition. In this test before the Board which recommended its adoption the magazine was loaded before the firing was commenced, and out of 20 shots, the last 5 from the magazine, 18 hits were made on a target $6 \times 2'$ at a distance of 100 feet. I have been unable to find the correct time required to do this but it is, if I remember aright, something near one minute. Remembering the use of the military rifle and the conditions which generally prevail when the time comes for this use I cannot help being opposed to a machine which admits of being used in more than one way to the same end. Fire discipline is the key-note of success in battles, but because of the imperfections of human nature it cannot be maintained beyond a certain limit. The time will come, in every well-contested conflict, when along your fighting line the animal will predominate over the reasoning man, and then animal instincts will alone account for results. Now, at this stage with two equal opposing lines, possessing in about equal proportion the animal qualities of courage and fear, victory is the prize to be snatched by the better trained, by that animal whose mechanical movements, acquired by habit, inflict the greater injury upon the other. Let us see how this works with our present arm and drill. If a proper fire discipline has been maintained by the offensive during the advance we find the soldier at the end of the controlled fire with five cartridges in his magazine, say, at about 300 yards from the defensive (and excellent indeed must be the fire discipline which will bring him so close). The conditions of battle have now caused the greatest excitement. He begins firing from his magazine, and in his ardor and excitement, with his comrades falling around him and with the din of battle in his ears he works the bolt back and forth and pulls the trigger as fast as he possibly can. The magazine is soon empty but still the bolt is worked and the trigger pulled. If he realizes the futility of his work, which he may do, after the firing-pin has struck into an empty chamber perhaps a dozen times, he is compelled to resort to his belt for a single cartridge and change entirely his mode of fire. The change is to a slower method and we have, instead of the increasing ardor and energy necessary for successful attacks as the distance from the objective decreases, a culminating point long before the moment of actual assault. The rapidity of fire exceeding that possessed by a single-loader of to-

day's pattern becomes desirable only after uncontrolled fire begins. If a magazine contains cartridges enough to carry the soldier from this time to the moment of the bayonet charge a change in the manner of fire is advantageous and consequently advisable, but never in a weapon whose magazine capacity is as limited as ours.

Most military writers state that a soldier in battle should have between 200 and 300 rounds of ammunition. A scarcity of ammunition in the fight means disaster, but it seems to me they have allowed a figure of safety of at least 2. "Volleys may be fired at 1200 yards" say our Infantry Drill Regulations—they may be fired at 2 miles for that matter—but for what purpose in either case, I do not understand, except to waste ammunition and warn the enemy of your approach and intended attack. The object of infantry troops should be to get as near as possible to the enemy before they begin to fight. To prepare for their advance we use artillery and in their advance we continue this kind of fire as long as possible to shelter them, supplementing it with that of the skirmish, or extended order line. This, however, is only a part of the preparatory stage and the less ammunition expended the better. I claim that unless an attacking line can approach to within 600 or 700 yards of the enemy's position without expending more than 10 cartridges per man, the proper preparation has not been made and men and ammunition are needlessly lost. If the fight occurred in the middle of a prairie and the enemy was foolish enough to forego intrenching, the drill book suggestion may be used to advantage, but such a supposition is not tenable. With a proper system of supply on the battle-field it seems to me that the present belt with a capacity of 100 rounds is sufficient. Closing the loops at the bottom would perhaps add to the value of the belt by making the cartridges more accessible. The haversack could be used to carry a few original boxes if, at times, 100 rounds were not thought to be enough. Opportunities for the transfer of the contents of these boxes to the belt would occur long before the critical moment arrived. The haversack is, of course, issued for another purpose, but the soldier if detached with three days' rations therein will not meet an emergency demanding more than 100 rounds until some of his hard tack is disposed of; the extra ammunition in this case can be, meanwhile, carried in his blanket roll.

The wonderful progress in the range and precision of small-arms has caused the bayonet to take a secondary place in the armament of an infantryman. Still, it is not obsolete; it has its uses, and because they tend more in the direction of moral than practical effect, we must not decry them, remembering that victory does not depend so much upon the number of dead in the enemy's ranks as it does upon the effect of their deaths upon the living. The probabilities are that our future wars will show the bayonet charge used exclusively for moral effect—to break down what little remnant of the fighting spirit a badly demoralized enemy possesses. Our present pattern of bayonet is about as clumsy as could be devised. A rod bayonet taking the place of the present useless ramrod and held in place by a lock somewhat similar to that used on the bolt of the rifle seems to me the most convenient and practicable form. The scabbard with its extra weight, its ability to destroy our cartridge belts, and interfere with their proper manipulation, would not be needed. The lock arrangement would overcome the objectionable feature of this form of bayonet experimentally used with the Springfield, the position of which depending on a spring soon became very insecure, often resulting in the loss of the bayonet.

Napoleon I. said that the intrenching tool was one of the five things with which a soldier should never part. If the condition of affairs a century ago led to this remark from such a source how much more so should it be accepted as an axiom of the present day when, compared with its condition then, artillery and rifle fire have progressed so much in accuracy, rapidity, range and penetration. Some form of intrenching tool is a vital consideration in future battles. We have observed its uses and value in the wars of the century, and seeing this and knowing the changes in arms which have occurred since the last war we can readily imagine its importance in the next. What it should be and the method of carrying it are the questions. No military writer has questioned the value of the great commander's remark that it should be carried by the soldier always. When the time comes for its use it is badly needed and delay may mean destruction. If we examine closely into the conditions of attack and defense of which battles are composed we see fire necessitating shelter on each side, but while fire forms the base or origin we can see that shelter, born of it, helps to perpetuate it. The more shelter on the defensive, the more fire required for a successful assault, and

the more shelter during the attack enjoyed by the offensive, the more the available fire. If then "fire is everything" it follows that its offspring and, in turn, parent—shelter—is not of small account. Almost all the nations of Europe have adopted some pattern of intrenching tool. The properties which they seem to think necessary in one are that it should be a digging instrument, a cutting instrument, and some think it should have a pick attachment for stony or hard ground. The Wallace spade, combining a spade, pick and grubber, is used by some regiments in the British service. It does not meet with general favor, however, but this is occasioned principally because it is not convenient to carry. Germany, Austria, Holland, France, Russia, Roumania and Greece, have all adopted what is known as the Linnemann spade, and its superiority over any other pattern appears to be firmly established by the number of countries which have adopted it. It is a steel spade, with a blade 6 inches wide by 8 inches long; a wooden handle, rounded at the top, makes the total length about 20 inches. It weighs about 2 lbs. The blade originally had one side sharpened for use as an axe and the other cut into saw teeth, but the different countries have modified these features, some retaining both, some one, and some the other. To the carelessness which is characteristic of us in army progress, and which finds us to-day years behind the times, is due, I suppose, the fact that we have not such a thing as an intrenching tool to be carried by the men. Numerous ingenious devices have been planned, tried and recommended, but excepting the hunting knife, whose use nobody seemed to know and which after trial was returned to the arsenals, condemned as useless, no issue has been made, nothing done. The opinions of nations who devote a good deal of their attention to the progression of the military art would seem to uphold a common-sense view, not born of experience, but of a consideration of the requirements of the article, in the selection of a type of intrenching tool of the Linnemann pattern. Now as to the method of carrying it. When first thinking over this matter I concluded that if something could be found to which it could be attached, and if, when so placed, it was out of the way and did not interfere with the soldier's actions all that was required was achieved. And with this in view I decided that the best way to carry it was attached to the blanket roll, blade up, by means of a couple of straps. But upon afterthought, upon looking into the conditions governing its use this

plan was given up. The generally admitted facts that occasion for its use may arise at any moment during an attack, that the passive defense requiring its use should be capable of instantaneous change to the offensive and that it should never be separated from the soldier prove conclusively the futility of a method requiring the slinging and unslinging of the blanket roll and the buckling and unbuckling of straps before and after its use. I would now recommend a leather sheath to contain the blade attached, by means of two short slings, to an adjustable sling belt passing over the right shoulder. When not required for immediate use a hook attachment on the sling belt on which a ring placed on the front top corner of the sheath may be hung would make it more convenient to carry. Objections have been frequently made to the quantity of tackle which the soldier now carries in the shape of sling belts. In my plan of outfit for an infantry soldier by substituting the blanket roll for the ordnance pack I do away with two slings, but even if the ordnance pack were retained and a scheme for carrying an intrenching tool required of me I would still suggest a sling belt. The paraphernalia carried by the soldier is divisible into two general classes—one, his weapons of offense and defense, the other, that pertaining to the wants of every-day life. The former should be so carried as to admit of immediate use and in their use he should be hampered as little as possible by the latter. The bayonet scabbard, or anything else—attachment or otherwise—which interferes with the use of our cartridge belt, which prevents its being used as a continuous belt, movable about the body so as to bring the ammunition under our fingers, is wrong; and this is why I think sling belts should be used. Now, the necessity for an intrenching tool is generally admitted: I say, let us adopt some kind and some method of carrying it, then practise its use. Besides the valuable instruction which can thus be imparted, the defects in the tool and in the mode of carrying it will be brought before us and, as a result of the ingeniousness for which we are noted, we will have, in a short time, an instrument and a system second to none.

CLOTHING, INCLUDING SHELTER.

The steps taken by the military authorities of all countries during the past quarter of a century toward the independence of the soldier in the field have been governed generally by two con-

siderations, viz.: 1st, what weight can the man carry and fight; 2d, what articles are most essential whose combined weight equals the answer to the first question. Of the Continental armies Russia estimates the weight which a man should carry at about 65 lbs.; Austria, 63; France, 62; Germany, with her new kit, 57½; and Italy, about 57. Our Army Regulations are painfully silent on the subject of a field kit. Department commanders generally regulate the field outfit as the emergency for its use arises. Generally, for an infantryman, the clothing consists of campaign hat, blouse, trousers, blue shirt, undershirt, pair of drawers, pair of stockings and pair of shoes, worn on the person, and overcoat, shelter half, one or two blankets, blue shirt, change of underclothing and pair of shoes, carried in some form of knapsack. Now in determining the weight which our soldiers can carry and fight we have a phase of the question not encountered by European armies—our small standing army is to be the nucleus of an army of millions in case of war. We may train it to carry 60 or 70 lbs. without much discomfort, but what about the millions who have had no such training. We want uniformity in equipment and manœuvring and we are to be their example in these matters. It may be said that a month or two of campaigning would give them all the training they would need in the matter of carrying weighty equipments. The fact that in the future great wars may be completed and important political divisions blotted off the map of the world in this period should not be forgotten—the training may be effected too late for any use. The question then for us to decide is what can the ordinary man, physically sound but not specially trained, carry without overexerting himself and, having decided this, what is absolutely necessary for his health and comfort in the field, fill in the differences in weight with ammunition. The great variation in climate incident to the vast territory which is ours, enters very materially into this discussion, and, it seems to me, makes it very desirable that we should have, even in garrison, a light and heavy equipment—the clothing, of course, to be the only part affected. Let the soldier wear the articles above enumerated as being usually worn, but make the textile articles of wool for the heavy and, with the exception of blouse and trousers, of cotton for the light equipment. A change of underclothing, a shelter half, an overcoat, one blanket for the light and two for the heavy are all that should be carried by him. Making a blue shirt and a pair of

shoes part of the contents of a soldier's pack borders on the ridiculous. If the man could carry food, clothing and ammunition in sufficient quantities to last him for two or three months the shoes and blue shirt should be carried and the question of the supply of an army in the field would become a minor one; but, knowing the absurdity of such a supposition and the necessity for a wagon train for the different tactical units, the question should be what is the greatest length of time for which a man can carry a complete equipment—food, clothing and ammunition. If we decide on two or three days give him nothing but what is liable to be used during this time. The ordnance knapsack meets with general disapproval as a means of carrying the extra clothing. It gives so much extra weight, is clumsy and so slung as to fatigue the man unnecessarily, considering the actual weight carried.

The experience of our late war shows us that packs of all kinds were generally discarded in the field, and what is known as the blanket roll generally substituted. And I am not, by any means, the only one who sees in it to-day, points of superiority when compared with the most recent type of knapsack. As the shelter tent forms, usually, the outer covering of the roll it may be discussed here. The old pattern of tent was too short, and being open at both ends its advantages of shelter were small; the material also was too light, and if we discarded the knapsack the tent poles required could not be conveniently carried. To remedy these defects I propose a tent 7 feet long, of heavier canvas and with ends, which may be of the same weight canvas as that in the present tent. Use the rifle as a tent pole; the front sight stud on which the tent rests is 4 feet high, and if we take a width of 5 feet of canvas and allow an overlap at ridge of 3 or 4 inches we get a tent 7 feet by 5 feet, by 4 feet high. Button the ridge and end openings, using some variety of patent metal button which is not sewed on the canvas, and strengthen button holes and buttons by an additional thickness of canvas. This would make a very desirable and serviceable tent, whose advantages over the old style are apparent at a glance. The use of the rifle as a tent pole may be considered a disadvantage by some, but do we use the rifle when we are asleep or at rest, and in either case can we find a place of storing it where it will be easier to reach in case of sudden alarm, or more effectively protected (a small flap of canvas attached, near the ridge, to the end piece and through which the

guy rope passes can be buttoned over the muzzle in inclement weather). The tent can be pitched like the one now in use, each man carrying three tent pins for that purpose. These are placed when tents are struck in a pocket provided for them in the upper corner of one end piece. In the lower portion of the same end piece are other pockets in which are stored an oil-can, towel, soap, razor, strop, comb, small mirror, needles and thread and a box of patent buttons—all very desirable, and some necessary in the field. Here also is a pocket for extra ammunition. The other end piece has at its outer corner a leather strap about 2 feet long and one inch wide, and opposite this, when the tent is laid on the ground, and about a foot from it, a buckle to fit the strap. To roll it, the tent is laid flat on the ground, inside uppermost, the pins placed in the pocket for them, heads first, the extra clothing and blankets are folded to conform with the width of canvas, the pocket end turned in and then the entire bundle rolled up and secured by the strap and buckle on the other end piece. With two end pieces, the canvas is of hexagonal shape and the strap secures the roll near its centre. A loose belt between 2 and 3 feet long binds the ends of the roll at the proper distance, determined by the size of the man, and the blanket roll is ready for slinging.

FOOD.

A few words on the method and materials employed in carrying and preparing food in the field and I am done. The haversack and canteen have both stood the test of service satisfactorily. The latter may be made of aluminum and so might the meat-can, knife, fork and spoon; a collapsible aluminum cup might well be substituted for the one now in use. With these changes this part of our equipment would be all that could be desired. A field ration, small in compass and of few component parts, but containing all the nourishment required by a soldier in the field is a great *desideratum*. The clothing which he must carry for a day will do for a month at least, and as the difference between its weight and the total which he is able to carry without destroying his marching or fighting qualities, is the joint allowance of his food and ammunition, the desirability of a compact ration of small weight is very evident.

Reprints and Translations.

GERMAN ARTILLERY AND PIONEERS.

(From "*Die Heere und Flotten der Gegenwart*," *)

Translated by CAPTAIN T. A. BINGHAM, U. S. ENGINEERS.

C. THE FIELD ARTILLERY.—I. Armament.

THE war of 1870-71 conclusively established the superiority of the breech-loader over the muzzle-loader and all the powers made haste to begin the necessary changes. In order not to be surpassed, Germany at once adopted the improved field-gun; taking the calibre 9 cm. for the field batteries (driving) and 8 cm. for the horse batteries.

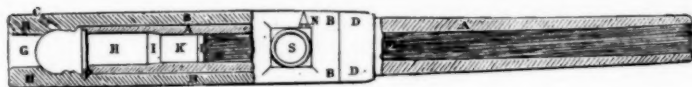
The initial velocity was greater than in 1870-71, the trajectory flatter, and accuracy and effectiveness greater. These advantages were obtained by improved construction of the gun and the use of coarse-grained powder. New double walled shells gave a greater number of bursting pieces. The introduction of ring shells increased the certainty of bursting and copper rifling rings gave greater accuracy of fire. Finally by a marked improvement in the manufacture of shrapnel, these projectiles were made suitable to be again adopted and by further gradual improvements became at last the principal projectile of field artillery.

After the experience of the Russians at Plevna, however, the question arose as to whether the field artillery with their shrapnel were in a position effectively to reach troops behind cover or to penetrate light covers. This led to the introduction of "torpedo" (high explosive) shells, which did not, however, altogether fulfill the purpose intended. Hence it became necessary either to introduce light mortars into the armament of field artillery or to take measures for getting such cannon, promptly and early, from the siege artillery armament. The latter method was adopted by Germany.

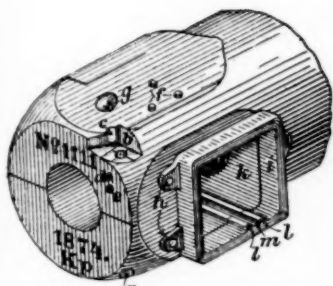
In 1886 the shrapnel was provided with a double fuse. If used as a time fuse, the projectile is burst in the air a short distance in front of the target; if used as a percussion fuse, the projectile bursts on striking and hence ordinary shell can be dispensed with for getting range.

The gradual advances which were made everywhere in the construction of all kinds of firearms brought many necessary improvements to light and led to various changes from which resulted the gun of 73/88 and later that of 73/91 and the arming of all field artillery, driving as well as horse, with a gun of 8.8 cm.

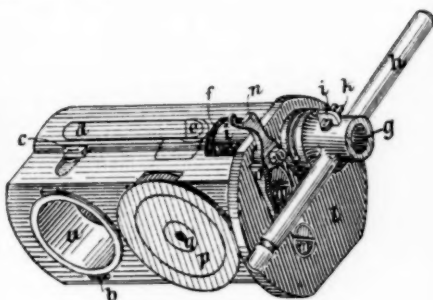
* See review of this work in January number, 1897.



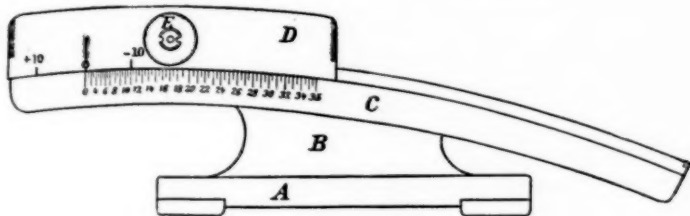
FIELD GUN C/73.



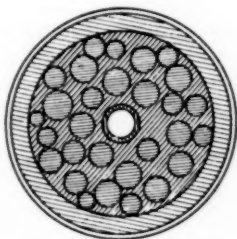
BREECH OF HEAVY FIELD-GUN C/73.



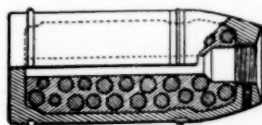
BREECH BLOCK.



AIMING ARC.

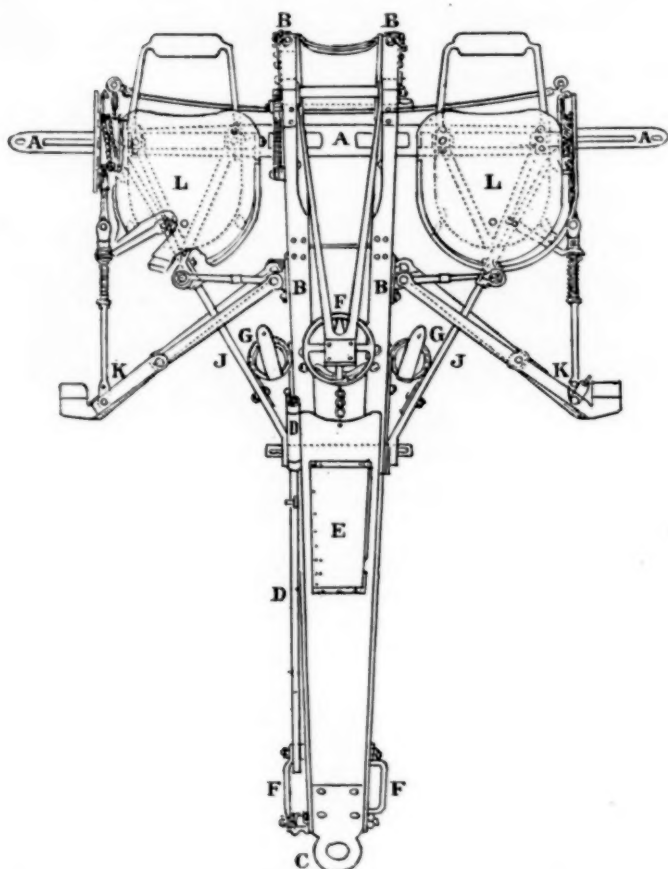


CROSS-SECTION OF SHRAPNEL.



LONGITUDINAL SECTION.

The gun tube is made of the most improved cast steel, containing a certain amount of nickel. Of all the new field-gun materials this has proved itself the most suitable for field artillery in our experience [the German]. It is a jacketed tube, that is, its rear end, especially over the powder chamber, is covered with rings in order to enable it to withstand the necessary enormous powder pressure.



FIELD CARRIAGE.

The vent passes diagonally through the breech mechanism which is of the wedge form. In order to close the joint between the breech closing block and the gun tube, packing is used which consists of rings surrounding the base of the powder chamber and so constructed as to add strength to the breech mechanism.

Sighting is accomplished by means of a fixed front sight and a removable rear sight. For firing against an invisible target or from a hidden position, a special device is used for sighting, called an aiming arc. The rifled part of the gun tube is cylindrical, while its rear part is enlarged into a powder chamber.

The carriage is made of steel plates, the two sides of the main member



FIELD-GUN UNLIMBERED.

of which (the trail) converge somewhat towards the rear. The elevating device is fastened on the trail. There are two seats on the axle for two of the gun crew, one on each side of the gun. In horse batteries these seats are not provided as all the cannoneers are mounted on horses.

The propelling charge is nitrate powder in the form of flakes, giving very little smoke. The bursting charge of shrapnel is black powder; of "torpedo" shells is picric powder, a very high explosive.

The projectiles of the field artillery consist, at present, of:

1. Middle chamber shrapnel 81 (field shrapnel). The bursting charge runs through the middle of the projectile, surrounded by the bullets with which the projectile is filled. It delivers 300 bullets and burst pieces. It has the double fuse.

2. "Torpedo" shell, likewise with double fuse.

3. Case shot.

When the time fuse is used, the bullets and burst pieces of shrapnel scatter in cone shape downwards and especially to the front. An average space of 218 yards is thus covered by such fire, which is dangerous for men lying down.

When the percussion fuse is used the shrapnel acts like a shell and, as its bursting charge is black powder giving a white smoke, it is used for getting ranges.

The "torpedo" shell gives about 500 burst pieces. With a time fuse, it is used against troops behind cover, because the great force of the high explosive charge drives the pieces in *all* directions; with percussion fuse the torpedo shell is used to destroy cover of all kinds. The effectiveness of the torpedo shell with percussion fuse depends, however, very much on the kind of soil attacked and is only moderate against upward slopes or soft ground. The smoke from its explosion is very dark or black, and hence it is not suited to getting ranges.

The case shot contains 67 lead bullets and is intended for short ranges. It was a makeshift in 1870.



LEADERS ON THE MARCH.

WHEEL HORSES.



FIELD-GUN ON THE MARCH.

The greatest range of shrapnel, time fuse, is 4500 metres = 4905 yds.

The greatest range of torpedo shell, time fuse, is 4500 metres = 4509 yds.

The greatest range of projectile, percussion fuse = 6500 metres = 7085 yds.

Case shot is used only at 325 yds. and shorter ranges.

The firing table of field gun C/73/88 gives for shrapnel C/91 initial velocity of 442 m., and of field-gun C/73/91 for torpedo shell initial velocity of 1450 feet.

The error of departure is $\frac{1}{16}$ of one degree.

This means that the projectile, having a velocity measured a short distance in front of the muzzle, flies 1450 feet per second. But while the projectile leaves the bore of the gun in about $\frac{1}{1000}$ of a second, the powerful recoil during that time so changes the elevation of the gun tube that the elevation of the projectile on leaving the bore is about $\frac{1}{16}$ of one degree higher than it was when the gun was originally aimed with the projectile at the base of the gun.

The movable sight has a side motion to permit of correction for drift of the projectile to the right in consequence of its rapid rotation, due to the rifling, about its longitudinal axis. This drift amounts to

4 metres for a range of	2000 metres.
28 " " " "	4000 "
156 " " " "	6500 "

The dimensions given in the following tables of accuracy under the head of 50 per cent. hits are based on the most favorable location for the middle hit—viz., the middle of the target. This presupposes that the target is so large that there are no misses in side shots falling within the limits of the target in height. For example, at 2000 metres, 50 per cent. of hits with percussion fuses will be attained if the target has a height of 2.5 metres (or a length of 23 metres) with the middle hit in the middle of the target and with

a breadth of target so great that side misses do not occur. This required breadth is obtained by making it equal to 1.8 metres \times 4.

With a target 2.5 m. high (or 23 m. long, in the direction of fire) and 1.8 m. wide, 25 per cent. of hits are obtained if the centre hit be in the centre of target. Suppose a wall 2.5 m. metres high is being fired at from a range of 2000 metres and that it has sufficient breadth; then, if half the shots are short or over, that is, below the base or over the top, we can reckon on from 50 per cent. of hits down to about 41 per cent. The probability of hits outside of the 50 per cent. area of target is very much less than inside.

EXTRACT FROM FIRING TABLE.

Range.	Elevation.	Allowance for deviation.	Angle of fall.	Time of flight.	1 st of one degree in elevation raises the hit.	1 st of one degree high alters the range.	Bursting height for 50 m. of bursting range.	Final velocity.	Dangerous space for a target 1.7 m. high.
m.	Deg.	Scale divs.	Deg.	Sec.	m.	m.	m.	m.	m.
1500	2 $\frac{1}{2}$	31	4 $\frac{2}{3}$	4.4	1.6	23	3.4	290	23
2000	4 $\frac{1}{2}$	32	6 $\frac{1}{2}$	6.2	2.2	20	5.3	268	16
2500	5 $\frac{1}{2}$	33	8 $\frac{1}{2}$	8.2	2.7	18	7.7	249	11
3500	10 $\frac{1}{2}$	35	15 $\frac{1}{2}$	12.6	3.7	14	13.7	220	7
4500	15 $\frac{1}{2}$	39	24 $\frac{1}{2}$	18.1	4.6	10	22.9	198	4
6500	41 $\frac{1}{2}$	54	59 $\frac{1}{2}$	39.9	207	..

TABLE OF ACCURACY.

Range.	Percussion Fuse.			Time Fuse.	
	50% of hits require a target.			50% of hits lie in a space.	
	High.	Broad.	Long.	High.	Long.
m.	m.	m.	m.	m.	m.
1400	1.4	1.2	21	2.0	25
2000	2.5	1.8	23	3.4	28
2400	3.6	2.4	24	4.6	30
3400	...	4.1	29	9.1	35
4500	...	6.6	35	19.3	41
6500	...	13.2	60

For a target, in the open and easy of observation, a complete war equipped battery, at a range from 3000 m. to 1000 m., has a great advantage over advancing infantry. It is only at ranges below 1000 m. that the fire of bodies of riflemen becomes equal to that from a battery.

In the fight between field batteries, effectiveness beyond 3000 m. is but small. At 2500 m. the battery whose range is got first will suffer the more.

Gun crews in driving (field) batteries carry a short bayonet on the belt.

Officers, non-commissioned officers, gun crews and drivers in the horse artillery carry sabres.

Excepting drivers, all artillerymen carry the revolver 83.

The following intrenching tools are carried by each driving or horse battery :

38 large spades; 31 mattock picks; 11 axes; 23 hatchets.

2. *Equipment*.—Helmet, knapsack, belt and clasp, sabre belt for drivers without cartridge pouches; rest of equipment same as in the infantry.

The helmet is, except in Bavarian troops, surmounted by a ball.

3. *Clothing*.—Blue coat with black collar and bindings; red shoulder pieces. Only the Saxon artillerists wear green coats. Trousers and all other clothing the same as in the infantry, except that the Bavarian artillery have broad red stripes on the trousers.

In the Prussian Guard Corps there are pipings on the collar and, for reviews, black plumes on the helmets.

D. THE FOOT ARTILLERY.

1. *Armament*.—The German siege artillery showed itself invariably superior in its struggle with the French and its effectiveness against the, for the most part, out-of-date works of the French was very marked. It is true that rifled mortars were used in but small number but their destructive capabilities were proved to be most effective.

From the experience thus gained, it was concluded to develop further the system of mortar fire, to increase the range and accuracy of flat trajectory guns and to construct them in the most enduring manner possible, in order to avoid the frequent accidents which occurred in their use during 1870-71.

All the inventions made during the twenty-five years subsequent to the war were of especial value to the fortress and siege artillery because variety of targets and guns is a peculiarity of this arm of service.

Recalling the changes during that period, it may be concluded that the construction of cannon, considered by itself, has made great strides. Because the slower burning kinds of powder have permitted powder chamber to be enlarged and powder charge to be increased; and consequently initial velocity and range to be increased. To have increased the charge of quick burning powders would have increased the danger of bursting the guns.

These slow burning kinds of powder were 1, the coarse grained, 2, the prismatic and later 3, the smokeless.

Accuracy was also increased, as in the field artillery, by the adoption of copper rings for taking the rifling.

Progress in the manufacture of gun material, of improved cast-steel, of hard bronze; improvements in breech mechanisms, for example, round wedges instead of flat; and the interrupted screw instead of either, especially for chambered mortars—all these were important helps in gun construction, as regards range as well as endurance. A range of 10 kilometres is now counted on (6 miles) in fortress warfare.

Improvements in fuses have had a remarkable effect on the capabilities of shrapnel and of mortar fire. The introduction of a high explosive that could be used for bursting charges has exerted much effect.

In the construction of foot artillery armament it had also to be consid-

ered that a partial function of field artillery was to be performed by it. Reference is had to the fact that upon mobilization a number of foot artillery batteries will be ordered out at once to follow directly after the active army, to be used against fortified places, especially the French frontier forts.

Another consideration of influence was that the increased use of armor in fortresses demanded increased projectile effect.

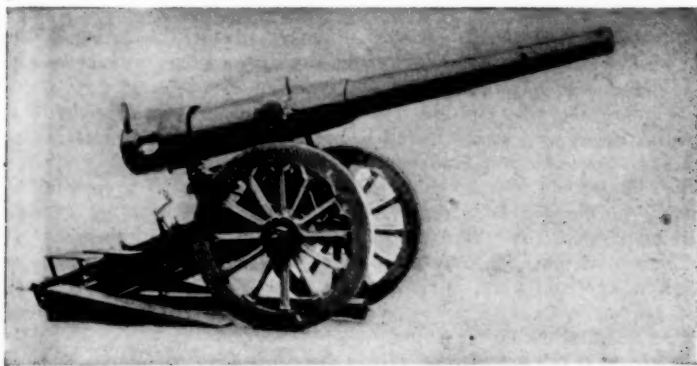
The following kinds of cannon are now adopted in the siege and fortress artillery:



THE 15 CM. (5.9) RING CANNON.

SIEGE GUNS.

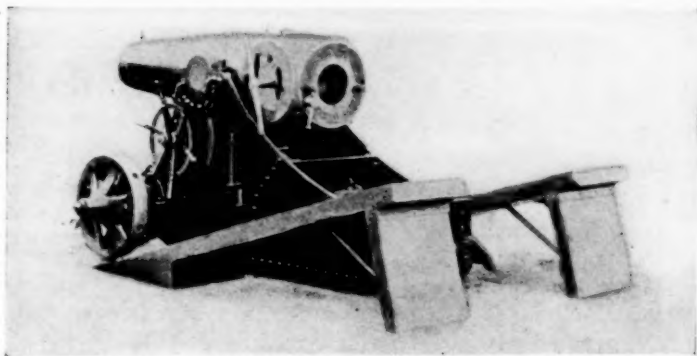
- a. Flat trajectory guns. Heavy 12 cm. (4".72) cannon.
Long 15 cm. (5".90) cannon.
- b. High angle guns (howitzers, mortars) 15 cm. (5".90) steel howitzer.
This is the principal weapon of the siege artillery and for the attack on fortified places.
21 cm. (8".27) mortar with inner steel tube. This is a heavy mortar of very decisive effectiveness.



LONG 15 CM. CANNON.

FORTRESS GUNS.

- a. Flat trajectory guns. Heavy 12 cm. (4".72) cannon.
Long 15 cm. (5".90) "
Heavy 9 cm. (3".54) gun.
The heavy field-gun.
The light field-gun.
The 9 cm. (3".54) steel cannon.

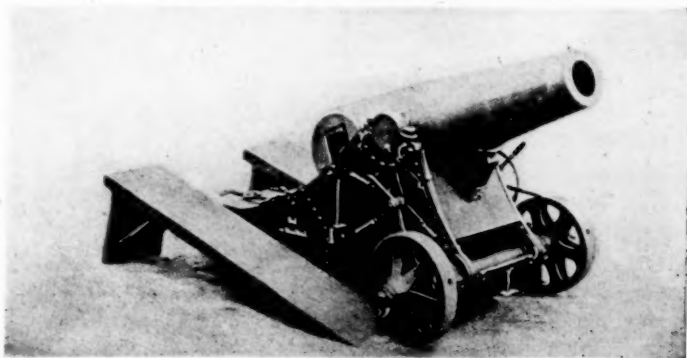


THE 21 CM. MORTAR.

- The 15 cm. (5".90) "ring" cannon—tube reinforced by rings.
 - The old 12 cm. (4".72) gun.
 - The old 15 cm. (5".90) gun.
 - The 21 cm. (8".27) jacketed cannon.
 - Short 15 cm. (5".90) cannon.
 - Long 15 cm. (5".90) mortar.
 - The 21 cm. (8".27) cupola howitzer.
 - The 3.7 cm. (1".45) revolver cannon.
 - 5.0 cm. (1".97) quick fire cannon.
 - 5.0 cm. (1".97) cannon.
- b. High angle guns.
- c. Short range guns.

The short range guns are intended to repulse attacks in force and to flank the ditches.

Finally, the fortress artillery have illuminating rockets fired from stands. Sea-coast guns are a special arm of service, whose projectiles are inten-



THE 21 CM MORTAR.

ded to penetrate side armor of ships and their protective decks. Among them are guns and mortars of 15 cm. (5".90); 21 cm. (8".27); and 28 cm. (11".0).

The following projectiles are adopted in the foot artillery:

1. Torpedo shells.
2. Long shells (projectile with the ordinary bursting charge).
3. Shrapnel.
4. Case shot.

The carriages for siege guns and, with few exception, of the fortress artillery also, are not only intended to be fired from but to be used for transportation of the piece, and have been lately improved.

The 15 cm. (5".90) steel howitzer has a low carriage capable of also easily transporting the piece.

Large wedges are, in action, placed behind the firing wheels to check recoil.

For long distance transportation, the heaviest guns are lifted up on special cannon carriages.

Siege-gun limbers are built with saddles in which the guns lie during transportation—they carry no tools nor equipments nor any ammunition. Only the 15 cm. (5".9) howitzer has a limber chest on its limber—but this piece is really only a heavy field-gun. If we were to take such guns into the field, it would be a return to that period in the 18th century, when we had discarded the parks of heavy guns which, at that time, followed an army in the field.

This shows that one cannot always regard necessary changes as absolute progress at the time; and is, also, a proof of the many-sidedness of war.

The effects of modern siege and fortress cannon are tremendous. Ordinary earth cover, such as was formerly bombproof, is now no longer sufficient. The disturbance caused by the bursting of a heavy high-angle projectile resembles the blowing up of a small mine.

SMALL-ARM ARMAMENT.

The foot artillery carries the 91 rifle, which is only 95 cm. (37".4) long and weighs 3.1 kg. (6.82 lbs.). It is sighted only to 1200 metres=1308 yards. It varies but slightly from the 88 rifle.

The bayonet is similar to the 71 bayonet worn by the infantry. Officers, first sergeants, etc., carry the officers' artillery sabre.

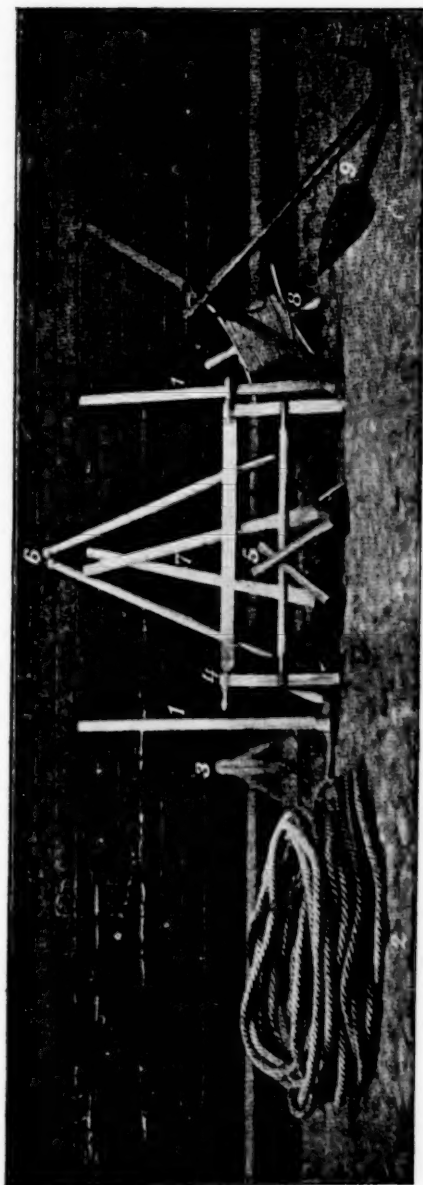
EQUIPMENT.

Helmet surmounted by a ball instead of a spike, knapsack, belt, coat straps, two cartridge pouches.

The foot artillery carry neither intrenching tools nor tents.

CLOTHING.

Blue coats; collar and its bindings, black; shoulder pieces, white. The coats are green in the Saxon foot artillery and light blue in the Bavarian. Trousers are gray, except in Bavaria where they are light blue.



PIONEER TOOLS.

E. PIONEERS.

They are armed with the 88 rifle and a bayonet, the fascine knife. Officers, first sergeants, etc., are armed as in the infantry.

Each company carries the following intrenching tools:

88 large spades,
45 axes,
44 mattock picks,
18 hatchets.

In the intrenching and tool wagon are:

60 large spades,
20 axes,
30 mattock picks,
12 saws.

The helmet has ornaments of white metal. All leather is black. Coat is blue (Saxon, green). Collar and its bindings are black. Shoulder pieces with numbers are red. Buttons are white. Officers wear silver lace on the collar. Otherwise, equipment and clothing are the same as in the infantry.

F. RAILROAD TROOPS.

Armament, equipment and uniform same as in the Pioneers. A letter "E" is worn on the shoulder piece.

G. THE TRAIN.

1. *Armament.*—Carbine 88; cavalry sabre; officers wear the cavalry officers' sabre of 1852 and the revolver 83; first sergeants, etc., wear the same.



LOADED PONTON WAGON.

2. *Equipment.*—Shako, with black plume for ceremonies. Officers wear helmet, white sabre straps, bandolier, coat straps.

3. *Clothing.*—Blue coat; light blue collar, bindings and shoulder pieces. In Saxony, light blue coat, black collar and bindings, light blue shoulder pieces.

Train soldiers who belong to the various bodies of troops in the war formation wear the uniform of such troops and also their side arms.

Letter-carriers in the war formation wear crimson collars and bindings.

IX. INTERIOR ADMINISTRATION AND GARRISON DUTY.

The first title includes:

(a) The business routine of the various headquarters;

(b) The daily issue of orders to the troops;

(c) Such service reports as pertain to 1. maintenance of order and discipline;

2. health and cleanliness;

3. quarters, food and equipment;

4. barrack life of the troops.

All this is techni-

cally called "interior administration." Interior administration must be so arranged as to resemble field requirements, as much as possible, in its routine and in the blanks used. The main points of clerical routine are described in the account of the functions of the general staff and of adjutants. Something remains to be said here, however, in regard to the form and routine of daily business.

One or more office rooms are supplied only for headquarters down to and including those of a battalion (infantry, cavalry and artillery). Companies, troops and batteries must utilize the first sergeant's room for the small amount of necessary clerical work.

Office hours are established by the corresponding commanding officer, and they are made longer as required by the work to be done.

Upon the arrival of the mail, the commanding officer or the adjutant acting for him puts on the "receipt stamp." The papers are then numbered and entered in a journal. Answers and other necessary papers are then prepared by the adjutant, or if necessary, by the commanding officer himself.

Registration in all offices is done under four classifications, each of which includes one or more kinds of administrative business.

At an appointed hour towards midday the commanding officer receives the reports of

1. The adjutant.
2. The general staff officer (for a division and upwards).
3. The auditor.
4. The inspector.
5. Intendance officials.
6. The military surgeon.
7. The paymaster.

After the transaction of this business and the signing by the commanding officer of necessary papers, these are made ready for transmission at once, the "sending stamp" put on, numbers affixed and entry thereof made in the journal with briefs of the contents.

"Short-hand" is much used in the German army.

After reports have been made as above, follows the issue of orders to adjutants and first sergeants. At this time is published the "parole" given out by the "commandant of the place" or by the ranking officer of the garrison. This old custom, is of course, derived from the campaign custom of former times of using a certain word by which friends could know each other at night. This word of recognition gradually crept into garrison service under the name of "parole," while, for service in the field, the Prussian army introduced another "signal and cry" which was only abolished in 1887, whether rightly or wrongly will not here be argued.

The "parole" is, as a rule, the name of some combat or a phrase like "Long live the Emperor!"

After this, the ranking adjutant dictates to the others the orders of his commanding officer. These pertain to the service routine for the next 24 hours; for the military day begins and ends at noon. These so-called

"parole orders" give all the details of service for the 24 hours especially as regards the drills to be held; they also cover:

Labor ("fatigue").	Matters of routine.
Courts-martial.	Promotions.
Garrison-duty (a special classification).	Changes of station.
Details for detached service.	Leaves of absence and furloughs.
Punishments.	Commendations or compliments.

[It will be remembered that these orders are dictated to adjutants and first sergeants who write them simultaneously, thus saving labor and insuring promptness in transmission.—*T. A. B.*]

The first sergeants then read these orders to their captains who, if not under higher orders at the time, at once take steps for carrying them out or for the necessary action by their companies. The orders are entered in the so-called "parole book" or "order book" and are transmitted to other officers of the company and to the men by sending copies or the book itself and by reading them out at the next "call" or assembly of the company.

At this time also are brought to report to the captains, the new recruits received; men going on detached service or otherwise leaving by order; men who are to have orders of punishment published to them; and men to be punished by the captain acting as "summary court" or as examining officer before they are referred to a higher court.

Every morning the men who report sick are taken to the surgeon for his action and thereafter every company, troop, etc., renders a "morning report" of its actual strength in rank and file, showing the number sick, in arrest, on detached service, on furlough.

Upon these the battalion reports are based which then go to regimental headquarters.

The companies make a "ration return" every month and upon these are based the ration returns of the battalions.

In every company a "non-commissioned officer of the day" is detailed to maintain order and discipline and to assist the first sergeant. He inspects all barrack rooms, the first thing in the morning; takes men who report at "sick call" to the surgeon and reports action on them to the first sergeant; takes men placed in arrest to the confinement room. He is responsible for the cleanliness of corridors and stairs of barracks.

In the squad rooms the room orderlies (generally the oldest soldiers) are responsible for cleanliness.

There is also a commissioned barrack "officer of the day" for each barrack, who has charge of the barrack guard and is over the non-commissioned "officers of the day" above referred to.

[NOTE.—Barracks, as mentioned, generally quarter a battalion.—*T. A. B.*]

The ranking officer in each barrack acts as "barrack president" and deals directly with the "barrack inspector," who is the representative of the garrison administration.

Commissioned and non-commissioned "officers of the day" must not leave the barracks during their tours of duty.

After the midday issue of orders the non-commissioned "officer of the

day " publishes them in the squad rooms in case no "call" or assembly of the men is to take place at once.

The word "call" as used (*appell*) means an assembly for roll-call or publication of orders [what is often designated in the U. S. Service as "formation."—*T. A. B.*]

In the evening at "taps," the non-commissioned "officer of the day" makes the rounds of the squad rooms, notes who are absent and reports to the first sergeant ["check."—*T. A. B.*] He also inspects the canteens [Post Exchanges.—*T. A. B.*] and sends out all the soldiers he finds there.

The term "interior administration" also includes policing of barracks and their yards or the parts of towns surrounding them. Further, all other "fatigue" labor done by a subdivision of troops; receipt of rations in the kitchen; preparation of meals by the cook detailed for that duty; marching to and from meals and behavior at meals; payment of troops.

Bread is issued to the men every fourth day. An officer is present at the issue, to inspect and taste it and to reject defective loaves.

The men are paid every ten days, counting from the first of the month. This formation is "pay call." The company commander is present and asks each man if his pay is correct.

Messes are by battalions and also by companies, and are inspected by an officer daily.

Although, when in the field, the routine of duty is altered by a hundred different incidents and circumstances, still, the principle of definite times for duty exerts its beneficial influence for an exact and punctual transaction of business.

GARRISON DUTY.

By this term is meant such duty as may be ordered for all the troops stationed at one locality by their proper commanding officer or by the ranking officer of the garrison. Only in rare cases are drills so ordered, but the duty consists of actual services rendered by the military for the benefit of garrison institutions or for the general good. The first and most important is

GUARD DUTY.

Guards are posted to protect government property and prisons, to maintain order and for similar purposes. Guards of honor are posted for his majesty the emperor and king and for German and foreign sovereigns.

Officers and men detailed for guard duty assemble at some designated place. It depends on local orders whether guard mounting takes place under the orders and superintendence of the commanding officer of the troops, the garrison officer of the day, or the commanding officer of the place and the "garrison major" (Platz major).

Garrison guards are detailed from the infantry, only exceptionally from foot artillery and pioneers.

Guard mounting takes place with drum corps or bugler and the guard is then under the orders of the commanding officer of the place, the officer of the day and guard patrols. Orders are obeyed only when from one of these sources. Guard mounting includes a passing in review and the old guard is then relieved with simple forms established by regulations. Morn-

ing and evening, the outlying guards report to the main guard station of the garrison and these reports are transmitted to garrison headquarters.

Honors to be paid by guards and sentries are laid down in garrison regulations. The regulations for guard duty are strict and form a good preparatory school for the different forms of this most important duty in time of war. Leaving a guard or post, sleeping on post, laying down the rifle—all are stringently punished.

Guards are authorized to make a formal imprisonment only by order of a court or of some high authority. They are authorized to make temporary confinements if any one be caught in delinquency or crime or deliberately violates the regulations for guards and sentries.

GUARDS MAY USE THEIR WEAPONS.

1. If any one actually resists arrest or attempts flight thereafter.
2. To repel assaults on guards.
3. To disperse a riot, if, after a thrice-repeated call to disperse accompanied by a bugle signal, the mob does not disperse or does not lay down any weapons it may have or working tools intended for use as weapons.

The officer of the day and the patrol officers inspect the guards by day and by night.

Uniform for guard duty is helmet, dress coat, cloth or linen trousers, knapsack with mess can, rifle and bayonet. Officers always wear the sash.

Garrison "fatigue" duty is mostly for depots, laboratories and military institutions of all kinds. The men are then, for the time being, under the orders of the department for which they are working.

Going to church is also regulated by the garrison headquarters and counts as garrison duty.

Court-martial duty by order of the garrison commandant is also garrison duty.

Quelling disturbances in a town is garrison duty. The troops are detailed by garrison headquarters but are then handled from corps headquarters.

The primary law in regard to the use of the military in Prussia is the law of March 20, 1837, regulating the use of weapons by soldiers. Other States of the empire have similar laws of their own.

Firearms will only be used when other weapons have proved powerless (Par. 7).

It is a ground principle that the military step in only upon call of the civil authorities; and that this shall be for guard duty or for quiet and order in case of pressing danger.

When, however, the military are detailed to uphold the civil authorities, not the civil but the military commander must decide whether and in what manner weapons shall be used.

X. DEVELOPMENT OF TACTICS, DRILL REGULATIONS AND INSTRUCTION— INFANTRY, CAVALRY AND ARTILLERY. HISTORICAL.

At the commencement of the 18th century the superiority of firearms for footmen, over the pike, had been established. The result was the

"linear" system of tactics which maintained itself in the Prussian army until the end of that century and even to the beginning of the 19th. In that system the greatest stress was laid upon the greatest possible speed in the use of the firearm, upon fire in masses, the salvoes and upon the movements of subdivisions in close order.

The training of the men, drilling, that is, developed in many armies into much over-refinement. It was only in Prussia, under kings Frederick William I. and Frederick II. (the Great) that drill regulations were simplified and the Prussian army quickly surpassed all others in accuracy of evolution and rapidity of fire. These results were reached by a very strict discipline and by a course of instruction which demanded the most careful instruction of the soldier in details, as a foundation for his later training.

Frederick the Great demanded of his infantry an unhalting advance accompanied by firing and a final dash with the bayonet. His custom was to attack the flank of the enemy and by using the oblique order of battle to have one wing of infantry as reserve; and he succeeded in many cases in putting to flight the slower moving, unwieldy masses of his enemies. He required from his cavalry, also, the most exact evolutions in large masses and reckless attack at highest speed.

The artillery, which had been materially increased toward the end of the Seven Years' War, was much strengthened by Frederick's creation of horse artillery which acted most favorably for its development.

Fighting by infantry in scattered order had as good as disappeared from all well regulated armies, but was revived in the American War of Revolution and in the French Revolutionary wars. The column, which, in the 18th century, was only a manœuvre formation, was also adopted by the French at this time as a battle formation.

The "linear" system, which after Frederick's death became ossified and utterly ruined by stupid pedants, failed in 1806 for ever and was replaced in Prussia by a method of fighting which combined an attack in close column, to a certain extent, with an open order formation.

The newly formed "light troops," such as fusiliers, chasseurs, etc., made special use of the open order. The new principles were very suitably set forth in the Infantry Drill Regulations of 1812.

Even before 1806 the principle of using cavalry in large masses had been abandoned and in 1813 we find it, for the most part, divided up among mixed brigades which, at that time, were the first unit comprising different arms of service, corresponding to the mixed divisions of the present day.

The same happened to the artillery. The use of both these arms in large masses under one leader, was not nearly so common during the war for freedom as it was in Napoleon's armies. Rigid drill, with the greatest exactness of evolution, was retained from the old army, not only as a means to victory but for attaining a high degree of discipline.

A ruinous pedantry prevailed during the long peace from 1815 to 1848. The Infantry Drill Regulations of 1847 only added to those of 1812 a greater number of unpractical, over refined forms; but it did the one fortunate thing of introducing the "company column" and thereby giving

the infantry a formation which embodied the open order method most satisfactorily and at the same time opened a wide field of independent activity to the Prussian infantry officer. All this did not, however, come at once.

"Middle column" battalion line and battalion salvoes still remained, for long, as the principal fighting formation; and the company column and its use often led later directly across the path of tactical arbitrariness and obstinacy and greater scattering of the troops. However, gradually and after many struggles, the correct use of this formation forced its way through.

By 1849, the experiences of the minor campaign of 1848-49 had cut away many dead branches, but a fresh breeze blew over the army when the government of the Prince Regent came into power.

At this period armies everywhere had arrived at the point of striving for or of introducing an armament of the mass of the infantry with rifled muskets. Prussia had adopted the needle-gun which had been declared by most foreign officers as an impracticable weapon. In 1865, that is, after the Danish campaign, a high Prussian officer asked one of the best army commanders in a foreign army what he thought of the needle-gun.

"Useless for war," was the answer.

"But," replied the Prussian, "has your Excellency never heard of the action of Lundy in Jutland?"

"Never a syllable!"

The "Instructions for Field Service, 1861," showed the proper method of using this musket. But to the initiative of the army, of the officers themselves, must the credit be given for having, by unremitting study of the war experience of foreign armies (war in the Orient 1854-55, Italian war of 1859), created such an activity in training as to produce the Prussian infantry of the early sixties, which William I. had for use in his wars. Company commanders were well posted in the use of the small columns, which gave a certain amount of independent action, and the soldiers were well instructed in utilizing inequalities of *terrain* and in the movements of a line of skirmishers. This line was already, by drill regulations, divided into groups (instructions by the Prince of Prussia, 1854).

Special mention is deserved of the system of firing regulations as introduced in the Prussian infantry upon the adoption of the needle-gun. It was based on a thorough elementary preparation in aiming and firing; and secondly, on the maxim that no soldier should be advanced until he had made a certain number of hits at a certain distance. The men were divided into firing classes and could be promoted to a higher class only by making a good record. At that time no army could boast of anything like as good an average instruction in firing as the Prussian army. The result of the campaigns of 1864 and 1866 proved how high a grade the Prussian infantry had reached.

During the long years of peace the technical instruction of cavalry was improved by careful riding instruction, but for a long time attention to rough and cross country riding was neglected and the horses were spared too much. Manœuvres in large masses, too, were held only occa-

sionally. But a reaction set in during the fifties and sixties. Prince Frederick Charles and others pointed out the proper course for this arm; and yet, in 1866, the lack of a proper comprehension of the use of cavalry in large masses and of practice in reconnaissance duty was many times evident.

As early as the forties the artillery evinced a tendency toward lighter and more mobile equipment, and a new armament was adopted at that time. The introduction of rifled breech-loaders in 1866 failed in the results expected because the artillery was, as a rule, not properly handled. It was kept back too long and was not put in in masses.

The experiences of the 1866 campaign produced a complete revolution in tactical views. The cavalry and artillery made good use of this and the regulations which were issued enabled these arms to accomplish the tasks which fell to them in the Franco-Prussian War; although, it is true, there were times when the cavalry did not accomplish what it should have in reconnaissance duty. For example, after Weissenburg and Wörth, and on August 17 after Vionville.

The artillery was, for the most part, brought into action in masses in the true Napoleonic spirit and took a large share in deciding the tactical conduct of the war.

In 1866 the infantry method of fighting succeeded finely against the Austrians, who were armed with muzzle-loaders and had a defective tactics. But there were voices who claimed with justice that the future, when all armies should have breech-loaders, would demand a different training, and especially a better instruction of infantry in fire by masses, on the firing line; and a stronger control of fire, or fire discipline, in group firing.

For these purposes the useless formations of the 1847 regulations had to be done away and the "company column" and skirmish group developed as suitable battle formations.* But the authorities could not definitely decide to do this, and so the infantry entered on its new struggle with, to a certain extent, a double method of fighting; that of the drill ground with its antiquated formations, used only there, and that of the manoeuvre field. These antiquated formations and lack of practice in fighting by large groups, caused the Germans, opposed as they were to the superior rifle of the French, to purchase victory, at certain places in the beginning of the war, by very severe sacrifices. It must not be forgotten, however, that attack always is at the cost of great sacrifice. The course of the campaign finally developed the correct method of fighting.

Germany's wonderful success and the important experiences of the war now produced an activity in tactical and technical respects, in all armies, such as never before existed for minuteness and scope. A rich military literature sprang up everywhere, based on war experience. Opinions and theories crossed each other in all directions.

Considering first the infantry arm, we see that, as regards the proper methods, it was a very long time before we got out of the woods into the open, and that it was not found possible to throw off antiquity completely.

* See "Taktische Rückblicke," 1868, by Capt. May, who fell at Amiens. Also, "Die Entwicklung der Taktik von 1793 bis zur Gegenwart," von Boguslawski.

This was, however, to some extent compensated for by excellent advice in the execution of field service given to the higher officers and by important progress in the establishment of large battle-fire drills in the field. The firing school opened the gates of really scientific shooting (1878) but got beyond its proper limits because it preached battle theories which gave too much prominence to long range firing in masses (Major Mieg's system).

It would carry us too far here to describe in detail the tendencies in this direction and that. Let it suffice to say that the infantry, in spite of all difficulties, has still followed in general the correct path, and by the eighties had worked out an education suited to the weapons of to-day and the present method of fighting. This result is, in great measure, due to an intellectual impetus from the army itself which has exerted a powerful influence upon the methods of training and handling troops. This intellectual movement found expression during the seventies in a series of publications which can be truly said to have been of influence on all armies. In the sphere of general tactics and the handling of troops may be specified "*Studien über Truppenführung*," by von Verdy du Vernois and the publications of Scherff and Boguslawski. [NOTE.—Von Verdy's book should be called "*Studies in the Handling of Troops*," notes given by the English translator.—*T. A. B.*]

Meanwhile the publication of a new Drill Regulations could no longer be delayed unless we were willing to be surpassed by all other armies. So after a new Manual for Field Service had been issued in 1887 the long expected Drill Regulations were published in 1888. Notice must be taken of the thorough instruction, during this time, of infantry in the rapid construction of field fortifications, especially in throwing up rifle-pits with the small spade.

Since 1870-71 the cavalry has also experienced an important period of internal development. The Drill Regulations of 1876 had simplified the foundation formations and, in connection with a carefully graded instruction, required a good schooling in jumping obstacles, bold cross country riding and in covering long distances at a gallop. Finally, definite instructions were given for the formation and evolutions of large bodies such as cavalry divisions of six regiments. Reconnaissance was most thoroughly practiced in its minor and larger details and excellent results were obtained. By the general introduction of the carbine, the fight on foot was also brought into considerable prominence.

On the other hand there was too much tendency to give the cavalry the same activity on the battle-field as in the time of Frederick the Great; and an over refinement and pedantry crept in as regards battle formations of large masses which were directly opposed to Frederick's simple guiding principle. It was only toward the end of the eighties that simpler counsels prevailed which insist upon the impetuous dash of the first subdivision of the cavalry force. These ideas have found expression in the latest drill regulations. In 1889 the cavalry was equipped with lances throughout, a measure as to the advantage of which opinions are divided.

The tactical development of field artillery revolved mainly about the question as to how far large masses could be combined and handled and what was the organization most favorable for this; also, whether artillery

should, at least partially, accompany the infantry attack or whether it should retain its position. The drill regulations of 1876 and 1889 showed varying progress in the simplification, rapidity and mobility of evolutions as well as in the instructions for the use and handling of large masses.

Long stretches of rapid travel were everywhere practiced and, during the last ten years, a careful utilization of ground has been inculcated.

It has been adopted, as a general principle, that the effect of the latest infantry arms will be to compel artillery to use greater ranges; that smokeless powder gives the artillery disadvantages as well as advantages; that all recent technical changes have not altered the principle of fire by masses which gave such great success in 1870-71. It is also recognized that the hostile artillery is first to be subdued and that only after that should the direct support of our own infantry be undertaken; on the other hand that, in an attack by the enemy, artillery fire must be directed solely upon the attacking infantry.

So much for the tactical development of field artillery up to the present time.

As regards foot artillery, siege and fortress artillery, the sieges of Paris and of numerous other large and small fortifications developed technical artillery experiences which have already been considered. But the investment of Metz and the siege of Paris opened also a new era in fortress war and fortress construction which had the most radical influence upon the organization and use of foot artillery.

During the sieges of the war of 1870-71, so long as it was a question of formal attack and execution of technical work, the Engineer Corps and pioneers showed themselves equal to their tasks. But experience before Metz and Paris showed that they lacked somewhat to be desired in the practical utilization of terrain and tactical training of eye. Effort is now being made, by detailing them for detached service with infantry, to bring pioneer officers into close relations with that arm; and to get out the pioneer battalions oftener for field manoeuvres. Moreover the system of intrenchments has been much simplified. In general, continuous lines of rifle pits in their various forms have replaced separate intrenchments with a ditch in front. Cover is to be obtained by digging down, not by shovelling up. The type of field and temporary intrenchments consists of so-called "strengthened" trenches, as deep as possible and provided with covered shelters; combined with isolated inclosed points of support called "infantry trenches." Such works are to be strengthened at suitable points by emplacements for batteries.

The changes which have taken place in fortress construction and fortress warfare are discussed elsewhere.

WHAT WAR MEANS.

(From the *United Service Gazette*.)

EIGHTEEN years have now passed since the close of the last great European war, more than thirty years since the fall of the Confederacy terminated the bloody struggle between North and South in America, and forty years since Englishmen last faced civilized opponents of their own calibre in force. In Europe, in America, in England, a generation has arisen or is arising, which knows not war. In spite of civilization,—perhaps, indeed, because of it,—the combative instinct in the human being has not meanwhile lost its strength. The age of universal peace, for which poets and idealists have longed, recedes ever before the advance of time. The world has for twenty-five years been arming upon an unprecedented scale, and by the general anticipation of all, the time is fast approaching when the human animal will once more be sent to the slaughter. Mankind agrees that warfare is wicked, and yet it fights. For it is useless to denounce an evil unless practical steps are taken to remedy that evil, and in this case that means changing human nature, and remodelling the conditions of existence in this, our world.

It is of the utmost importance that all should know what war means, and a help to such knowledge is afforded by a paper in the *Fortnightly Review*, dealing with "The Human Animal in Battle." It is written by Mr. H. W. Wilson, the talented author of "Ironclads in Action." He reminds us that a few months ago we saw the people of the United States anxious to fight somebody for fighting's sake, though they have themselves had terrible experience of war. But those who have looked upon battle-fields of the Civil War are now passing away. To Englishmen, such a knowledge will be of value in two ways: it will make them anxious to avoid war, in the only way by which it can be avoided,—by adequate armaments; and it will dissipate the dangerous impression prevalent among so many civilians that, as the last resource, we can take the field with untrained men and win. The popular idea of war is largely based upon the popular history, the war correspondents, and the general's reports, in which, for obvious reasons, there is seldom a revelation of the true horrors of the engagement. Our fancy, our imagination are fired by the picture of magnificent chargers, of prancing horsemen, of gleaming bayonets, of heroic episodes; and we flatter ourselves that on such an occasion we, ourselves, should perform with credit. We see little of the dusty, yelling, hunger-stricken, blood-stained line of men who win the battle. And yet we want the horrors, as well as the glories, the actual emotions, the alternating hopes and fears, the agony and death, the wild panic, the triumphant onrush of the fighting line to correct our picture. We require, in fact, the story of war from the private's and the individual combatant's points of view. Such a story will be the most convincing possible argument for peace. Nor will the brave man be less brave because he knows the cup of which he will have to drink. Ignorance is not courage, though it has sometimes served to conceal the want of that great quality.

To make of the ordinary individual a good soldier, the most powerful emotion in the human animal, fear, must be subdued and overcome. Fear is defined to be that reaction which takes place through a sufficiently vivid representation of a possible pain or evil. It is greatest when the evil to be apprehended is most unknown, when danger which has never been encountered before is approaching. War-trained troops, men who have looked upon slaughter and death upon the gigantic scale of the modern struggle, no longer exist, and the peace-trained conscript has no knowledge to correct his fear. The machinery of battle has progressed till the possibilities of our modern weapons are appalling. Torpedoes, monster guns, high explosives, the swift arbitrament of the ram at sea; on land, quick-firing guns, using the deadly shrapnel, are almost untried implements, whose actual effect can only be conjectured. This much is certain, that the future battle will be a severer trial to the nerves than any past encounter. To meet that trial the nerves of the modern civilized man are less fit than they were in the past, as the increasing rush and worry of our existence, the railway, the telegraph, the herded aggregation of human beings in cities, conduce to nervous complaints. The machine moves upon an upward plane, the individual left to himself upon a downward one. To counteract this downward progress training and discipline grow ever more and more necessary.

The decay of religion, which is so widespread a feature of our times, has contributed to the downward progress of the individual, by making death more horrible because of the greater uncertainty of the future beyond the grave. To the Norseman, the Turk or the Christian, death was merely the passage to another and more blessed existence. To the modern doubter it is a leap into the unknown. The joys of Valhalla, the glories of Paradise, the dreamless sleep of Nirvana, or the tortures of an inferno may lie behind the veil; he knows not which. But he is fully aware that with death his present existence ends. All life's pleasures are over forever, and the future is an appalling blank. He will be prone to cling to the uncertainty of the present rather than put upon that may-be-shoreless sea.

Fear is greatest where the imagination is strongest. It is an emotion which seriously affects both body and mind. On the physical side it checks the flow of saliva, and brings that peculiar thirst of the battle-field; it causes organic derangement and a certain degree of muscular relaxation, increases the tension of the voice, and is accompanied by a desperate effort to avoid the danger. On the mental side it paralyzes the intelligence, and leads to the blind desire for flight, though sometimes it goes even further, and deprives the victim of all power of movement. If flight takes place it is the flight of panic, a reflex and often involuntary act. Only strength of will can overcome this tendency to run. As a matter of fact flight is rarely the best road out of danger: in battle it is the worst. To go forward and die is certainly better than to go backward and die; for, in the first place, the enemy who is experiencing precisely the same emotions will lose courage and shoot less steadily, thereby diminishing the risk of the assailant. Nothing is more contagious than panic; a single man with ashen face rushing to the rear will draw others after him and shake the confidence of all

who see him. Hence the problem is how to implant courage and avoid panic.

Courage is simply control of the nerves, and is largely due to the habit of confronting danger. General Sherman thus defines it: "All men naturally shrink from pain and danger, and only incur their risk from some higher motive or from habit, so that I would define true courage to be a perfect sensibility of the measure of danger and a mental willingness to incur it, rather than that insensibility to danger, of which I have heard far more than I have seen. The most courageous men are generally unconscious of possessing the quality; therefore, when one professes it too openly by words or bearing, there is reason to mistrust it. I would further illustrate my meaning by describing a man of true courage to be one who possesses all his faculties and senses perfectly when serious danger is actually present." Pride, habit, duty, these are the forces which enable men to control themselves. All can be fostered and implanted by training. Sheridan reckoned that of able-bodied men about one-fourth have not the requisite capacity for courage, and are, therefore, useless for battle. Such weak hearts must be weeded out. "No matter how brave a veteran may be," says Private Wilkeson, of Grant's army, "he relies on the men on either side of him to stand there till they fall, * * * he must know that his comrades are as staunch fighters as he."

Even in the bravest and most fully tried men fear is subdued and not wholly eliminated. Skobeloff said of himself, "I confess that I am at heart a coward." He despaired of General Gourko because the latter would duck to avoid bullets and shells. In the Northern army, at the close of the Civil War, General Horace Porter tells us that there were only two men known to him who never bowed the head to iron and lead. Of these one was General Grant. So purely a matter of habit, a reflex action, had such ducking become, that after a great battle men would involuntarily bob, as they stood or sat about camp, at the slightest noise.

How, then, is courage to be taught in peace? A Russian general once proposed to "salt" his soldiery by loading one rifle in ten with ball cartridges during manœuvres. This ghastly preparative was too revolting to civilized minds, and it has never been carried out; but if adopted, it would make the army trained under such circumstances invincible, and so in the end tend to shorten war and save life. It would accustom the soldier to the sights and scenes of the battle-field, and overcome his dread of the unknown. It would enable him to control his nerves in the tumult of the actual encounter. Such a pursuit as climbing has the same moral effect. Endurance, mutual trust, self-control may be learned on the high Alps, or, for the matter of that, in Wastdale, where a slip on the face of the mountain means destruction. The volley of stones down some precipitous gully is not less deadly than the hail of shells and bullets on the battle-field. And, in a less degree, hunting, and the manlier forms of athletics, give the same result. Sports involving risk of life are thus of supreme value from the national point of view, and this should be remembered when the ignorant and degenerate assail them.

Every-day experience tells us that courage can be acquired by the great

mass of mankind. At Bull Run, the raw Northern infantry attacked troops of their own quality in position with great spirit. They advanced boldly, till, finding that they were stiffly opposed, though, as a matter of fact, the Southerners were just on the point of giving way, they turned and ran. They were unused to the sight of bloody wounds and death; their loss was respectable; and for all their martial ardor they had not acquired self-control. But take the same infantry at Cold Harbor, seasoned by three long years of war. They were going to assault the most magnificent troops the world has ever seen,—Lee's Southern infantry,—and these intrenched. They knew that their generals were making a bitter mistake, and sending them on a hopeless errand. They were seen in the trenches before the assault, sewing their names upon the backs of their coats, that their bodies might be recognized and sent home after the attack had failed. "The impression," says Wilkeson, who was there and watched that heroic endeavor, "was that the task cut out for them was more than men could accomplish. * * * Though they had resolved to do their best, there was no eagerness for the fray." As daylight dawned, the long blue line leaped up and charged the works. They swept into the first line, but only to be at once driven out. They came back, having in twenty minutes left five thousand dead or dying on the ground; but their failure was not due to want of courage. Years later, Grant, with his own rare modesty and truthfulness, owned that the fault was his, that the soldiers were right, and that the assault should never have been made.

It is an affectation of a certain section of our press to set civic courage—the bravery of the policeman or fireman—above military courage. This, however, is an injustice, because it leaves out of sight the physical conditions in either case. The civilian may be presumed to be well fed, properly clothed, and in good health; the soldier, as often as not, has to fight with empty stomach, without sleep, ill-clothed, and sickly in health. Hunger and sleeplessness are sore enemies to courage, and it has been well said that at no time is a man more likely to play the coward than in the small hours of the morning, before his body is refreshed with sleep and food. The whole vitality is lowered by a long series of campaigns, and by the multitudinous discomforts which man, the animal, must undergo. When the Southern armies were raised for the war with the North, every private appeared with a trunk. He had a change or two of clothes, an arsenal of weapons, coats, pots, and pans galore. He had a negro servant to take his sentry duty and help him to move his goods. To the close of 1861, the Confederate stuck to his baggage. In a word, he did not know what war was like; but he did know what comfort demanded. Then the marching began. The trunks were burnt or abandoned; knapsacks were found to gall the back; a change of clothing was no longer necessary when the soldier had to carry it; great-coats were dispensed with; and most of the arsenal of weapons was sent home. The soldier was left with his hat, jacket, shirt, pants, drawers, socks, and shoes. His only baggage was a rubber and a woollen blanket, and one haversack. His rifle and bayonet were his only weapons, and his cartridges were carried in his pockets. With this equipment he faced the broiling sun of the Southern summer; with this the icy

winter of Northern Virginia. He slept in the open air and never washed. He was reverting to the animal.

To many civilized men such an existence would mean death, and these continuous hardships and discomforts did reduce the vigor of the Southern resistance, by driving many from the ranks, and by disabling all the weaker vessels. Cold, wet, and dirt are three terrible enemies. "Rain," says a Southern private, "was the greatest discomfort a soldier could have,—wet clothes, shoes, and blankets; wet meat and bread; wet feet and wet ground; wet wood to burn, or rather not to burn; wet arms and ammunition; wet ground to sleep upon." Tents are rarely carried in modern armies, and on bivouac no shelter is to be had. Dirt and its concomitant vermin are not less distressing to men accustomed to cleanliness. Worse of all is the want of food. The German Second Corps at Gravelotte marched twenty-three miles without food or water, and then engaged in the terrific combat in the Mance ravine. The French army of Marshal MacMahon for whole days before Sedan, had received no proper rations, and ate what it could, which was very little. To Lee's Southern infantry raw onions were "angel's food," in their own expressive phrase; a few handfuls of unground maize or corn, a scanty rasher of rancid bacon at rare intervals, were all they had to eat. When they received three days' rations they cooked and ate them, preferring to carry them inside and go hungry the two following days. They devoured rats, musk-rats, and squirrels when they could get them. Two days' sleepless marching and fighting without food was, we are told, not uncommon. The soldiers slept as they tramped the dusty roads, and at each halt men fell down in a dead slumber.

Nothing is truer than that a good commissariat wins battles, because with a good commissariat men go into action in good condition. But even with the best possible arrangements, a sudden emergency may arise, and the soldier may be wanted without delay. Imagine him, then, on his road to his first battle, foot-sore, hungry, wet, sleepless, depressed. He tramps steadily towards the roar of the guns with his heart numbed with apprehension. Young, nervous, excitable, he is going to be killed, and for what? The question "*Pourquoi est-ce moi plutot qu'un autre?*" which rose to Maurice Levasseur's mouth under the cannonade at Sedan, must be met and answered. Why should this individual starve, fight, and die, whilst that sits comfortable at home in his easy-chair, and reads of the battle with a pious acquiescence? This life at such moments grows very dear to its possessor, and beyond the grave is what? The loss is immediate and affects him acutely; the gain is remote, and will not advantage him. He is told that he will win glory, but of what use is glory to his clay? He is assured that he is supporting national interests, but what benefit to him, as he sleeps beneath the sod, will the increased prosperity of his country bring? His name will be forgotten, except it may be in one household; his remains will be shovelled hastily away, with a jest, perhaps; and the thirsty earth will drink up his life-blood. Duty, religion, the instinct of self-sacrifice, the fear of ridicule, these are the motive powers which can carry him forward and support him in such moments of questioning. The guns must have their human food.

Alone of men the condemned prisoner and the soldier assist at their own funeral. But so sanguine is the human animal after the first rebound of fear that it can never realize the imminence of death. "After all," each man reasons, "I may be spared." As he nears the scene of action, he begins to discover what war is. "It is not play. It is not pleasure. It is not sport under the greenwood trees, but a savage encounter with desperate adversaries, who deal death and grievous wounds with impartial hands," he will say with Private Wilkeson, as he sees the wounded straggling from the line of battle to the rear, men torn and mangled, as he soon may be torn and mangled; men proclaiming, as the wounded mostly do, that the day is going badly. "I never saw the rear of an army engaged in battle," said Sherman, "but I feared that some calamity had happened at the front—the apparent confusion, crippled horses, men lying about dead and maimed." His first impressions will yet further shake his nerves, and the sights of blood and death will sicken him.

What are the first sensations of the battle-field? Zola, Tolstoi, and Stephen Crane have imagined them, and combatants have written them. "Something whizzed past me like a big bluebottle on the wing," says Lieutenant Herbert of Plevna fame, "and the current of air caused by its rapid passage touched my ear. Another—another. All at once I realized that these were the enemy's bullets, and the discovery brought on a violent sudden attack of cholera-like disposition." The passage may be compared with Zola's description. "The now constant hissing of the bullets, with their sharp ping or buzz whispering around and sometimes into us, gave me a sickening feeling and a cold perspiration. I felt weak around my knees, a sort of faintness and lack of strength in the joints of my legs, as if they would sink from under me. These symptoms did not decrease when several of my comrades were hit," says Mr. Lee Goss, a former private in the Army of the Potomac. No one quite knows how he will behave. "No man"—I am quoting Wilkeson's stirring narrative—"really enjoys a battle. One has to string up his nerves and take a firm grip on himself morally, and hold himself in the battle-flames for a few moments until warmed to passion. The impulse is to run out of danger."

If the raw soldier is there and then led forward against the enemy, the trial to his nerves will be less severe than if he has to wait under a heavy shell and shrapnel fire to which he can make no reply. In the one case he will be moving and occupied, in the other case he will only have his danger to think about. This was, perhaps, the reason why, in the war of 1870-71, the German soldier rushed impatiently against the French positions. "The beat of the drum went before the thunder of our guns, and our power was shattered by the fire of the foe's unshaken infantry." He was anxious to end the period of tension, and to come to hand-grips with the enemy. But he paid, and paid very dearly, for his impatience.

No words can depict the uproar and confusion of a battle-field. The tremendous thunder of the guns, the roar of bursting shells, the incessant roll of musketry, the dense clouds of dust, the yells of the combatants, the shrieks and groans of the wounded, the ghastly human fragments strewn the earth, the smell of sweat and powder, making up an appalling ensem-

ble. With smokeless powder the whole battle-field will be visible, and there will be no screen between the fighters on either side. The pomp and circumstance of the battle will be more impressive; the combatants will be in sight of all field-glasses, and this may stir and move them to extraordinary efforts. Nowhere has man such a theatreful of spectators, nowhere such a background for his action. Picture the German artillery in action at the St. Hubert Farm during the battle of Gravelotte, under the eyes of the old king, his brilliant staff, and the vast German army. "The horse artillery battery taking ground to the south of the main road, moved like lightning through the hell of the French fire. The wheel could be observed from Gravelotte (where the king stood), and all hearts throbbed to see what would be their fate. Would they be able to form line? The battery commander, who was leading at a headlong pace, with a sign of his hand swung the battery round as if with a magic wand, until it faced Moscow; every one was at once off his horse, and all six guns let fly immediately. * * * But gradually the battery leader saw his battery melt away; the heap of dead horses in the rear continually increased, whilst between the guns there was a confused mixture of dead and wounded of both armies. The fortunes of the battery had been from the beginning watched from Gravelotte as it dashed forward from the defile like a column of dust driven by a hurricane; it could be seen with glasses how gun after gun was silenced, and how the living organism changed into a motionless, dense, helpless mass." One great action adds distinction to every life; to have been a protagonist on such a stage and at so decisive a moment, when the French counter attack was curbed and driven back by the tremendous fire of this battery and its supporting guns, was indeed glory to the survivors. But what of that "motionless, dense, helpless mass," torn by shell and bullet prone behind the battery? What of the limbs and bodies which had been men, thrown fifty paces apart, and strewing the terrain? "A desert covered with corpses" is the effective German expression. But it is on deserts covered with corpses that the foundations of empires are laid.

The human animal gains confidence from comradeship in death. It fears to cross that dark river alone. It gains redoubled assurance from the bearing of the higher intelligence, the ideal courage represented in the officer. The presence of Napoleon on the battle-field was worth—Mr. Wilson believes it has been calculated—ten thousand men. The presence of the general at the front endears him to his soldiery, who see that he is facing their risks, enduring their dangers and hardships. No complaint was so frequently made against the Northern leaders in the last year of the Civil War as that they did not expose themselves to risks. It was not a fair complaint, as many Northern generals were killed and wounded, and the leader has to be careful of risking his life, but it was made. The Southern generals, on the other hand, were reckless of their lives to an extreme degree. "Stonewall" Jackson, in his furious assault at Chancellorsville, moved with the advance of his troops, and paid the natural penalty. Longstreet and Johnston were repeatedly wounded. Five Confederate generals fell at North Anna, and many more were wounded. Yet by this exposure of their lives they made the Confederate soldier what he was. It is, indeed, on record

that on one occasion Lee put himself at the head of his troops for a desperate charge, and that his men demanded that he should not risk his life, raising the cry of "Lee to the rear." He obeyed their command, and they delivered their charge with success. But these were war-trained veterans, and Lee was the trusted hero of the Confederacy.

It has been said that the worst man makes the best soldier, and certainly the view which would send the refuse of the nation to the abattoir has much to commend it. But the times have changed since the days of the Peninsula War. Long-service troops have vanished; and to replace them the pick of every continental nation is in the ranks. Unfortunately, too, "worst" is a very vague and indefinite term. If worst physically is meant, such indifferent material will not stand the hardships of campaigning. If worst intellectually, it will be beaten by the superior intelligence of its opponents. If worst morally, it will want courage and backbone. The North attempted to utilize the dregs of its population in 1864-65 with the most convincing result. The criminal or pauper recruits who "jumped" bounties had to be sent under vigilant guard to their regiments. They were driven into battle by armed pickets and provost-m Marshals behind the fighting line. They were faint-hearted and stupid. They skulked persistently when they could, so that great hordes of "coffee-boilers" gathered at the rear during every encounter. They weakened the line of battle. In the words of Wilkeson, "take away the volunteers from the Army of the Potomac, and Lee could drown the rest of his army in the James River without firing a shot." But for the percentage of volunteers in the ranks, these cuffed and despised creatures would never have fought at all. The great mistake made by the North was in not resorting to conscription at once. Volunteers were called for first of all, and thus the brave, the ardent, the heroic, instead of leavening the great mass, were drawn off and dashed to pieces against Lee's intrenchments. The indifferent material in the hastily-raised French levies of the winter of 1870 was doubtless one cause of their easy defeat. Nothing could be expected from the mobile whose ignoble song was,—

*"Tant pis pour la Patrie,
Sauvons, sauvons notre vie!"*

of whom an eye-witness said "Rien ne bat chez eux: pas de sentiment du devoir; pas de sentiment de la Patrie." The system of recruiting in France, as in England to-day, has absorbed the pick of the combatants into the regular army. The French regular trained soldier did not fail in courage on the battle-field: it was the collapse of organization and generalship which brought his country defeat.

The religious and reckless man—the latter of whom is far from being in any sense the "worst"—by general consent make the best material for the soldier. War demands the sacrifice of the noblest natures. Sergeant Forbes Mitchell has given us a wonderful picture of one of the old "powerfully prayerful" Highland regiments, who for stiff fighting were unequalled. They were organized as a parish with ministers and elders, and they received communion before they fought. Like these were the men of the "Stonewall" brigade in the Civil War. Alas! they have vanished forever.

It is, as it were, a glimpse from the old world which sorts ill with these latter days. In Lee's army during the last hopeless months of the struggle, with the growing conviction in each man's heart that he was doomed, came a great religious revival. Men ceased to fear death, believing that sooner or later they must be killed, and that the date, the hour of their fate was "unalterably fixed." They looked at every moment for portents and for the visible hand of God. A hen, it was reported, had laid an egg with "peace in fifty days" written upon it. Their faith grew with every disaster. The future in this life was a void blank; they were living in the presence of eternity. Their moral condition will explain their terrible efficiency as a fighting force. They were soldiers indeed.

In every battle there must come a point when the strain upon the combatants of one side or the other becomes greater than they can endure. In a word, there is a breaking point. No race and no nation has a monopoly of courage, though the individual animal will in some cases be better than in others. The strain is constant for a certain degree of training or courage in every age; modern weapons kill and mangle. They can do nothing more. The first emotions of a charge or attack are intoxicating in the literal sense. "The rest of the assault is blurred in my recollection; I remember but the main features," says Lieutenant Herbert of the desperate attack on the Kavanlik redoubt at Plevna. "Awful rifle-fire from Kavanlik trenches—guns discharge at point-blank range—gaps in my line—bugles sound 'storm'—bayonets fixed and wild cries of Allah—our skirmishers fall back and mix with main body—we are now in front line—troops get into confusion—brief and desperate encounter in last trench—we proceed to leave third trench, but lines falter under the awful fire from redoubt. We retreat to trench, where we come to a full stop." So in a few words is compressed a world of human agony and woe. As the losses become heavy men awake from their intoxication, fear assails them, and they begin to drop behind and skulk, lying flat on the ground. The German skirmish-lines in 1870 left hundreds of such wounded men in each cove and hollow of the ground as it moved forward. In vain the officers used their swords upon them; their nerves would not stand the strain.

Heavy loss brings the line up quickly, if it is inflicted in a short space of time. The 38th German Brigade at Mars-la-Tour checked at a loss of about 29 per cent., and seeing a French force advancing to a counter attack turned and ran. The Prussian Guard at Gravelotte gave way under a loss less than half as heavy. In each case the troops engaged were fighting their first action, but it is impossible to discover why, in the one instance, men could stand more than presumably picked troops of their own race endured in the other. There must have been some explanation, but it is not apparent, unless, indeed, the guard saw that the attack was hopeless, and refused to go forward; such incidents happen in war with the most experienced troops. At Petersburg, in the American Civil War, before the assault the men of a brigade famed in the Army of the Potomac for its desperate courage, when asked whether they were going to charge, said, "No, we are not going to charge; we are going to run towards the Confederate earthworks, and then we are going to run back. We have had enough of

assaulting earthworks. We are tired and hungry, and we want to rest and eat."

Not the least terrible trial of the battle-field is a rout with the enemy in pursuit. The passage of the Beresina will to all time express the extremest intensity of mental torture. At such a moment men think only of themselves; panic usurps the place of reason and duty, and to escape from the imminent danger at the cost of whatever effort is the only purpose of the mind. They discard their incumbrances, their weapons, and even their uniforms. At Gravelotte the shattered German infantry burst from the wood in the Mance ravine, panic-stricken, wild with fright, deaf to their officers, devoid of all self-restraint, and charged upon their own guns and upon the king, whose presence failed to restrain them. At Plevna, when the first Russian attack recoiled, the soldiers were seen running without caps, rifles, boots, or coats, whilst their officers in vain strove to rally them. "I had never been in a general retreat," says Lieutenant Herbert, "and I do not care to dwell upon it, as it is far more terrible than the most desperate encounter."

But war would be comparatively humane if it were not for the fact of the wounded. In future battles with the great range of the present small-bore rifle, it will be almost impossible to give satisfactory first aid on the battle-field. Field hospitals will have to be farther towards the rear, field ambulances will not be able to approach closely the fighting line. The wounded will have to lie longer where they fall, and more men will be wounded and fewer in proportion killed outright by the small-bore bullet. They will be exposed to fresh injuries from the hostile fire and from the movements of cavalry and artillery over the ground. The surgical resources of an army are strictly limited, even if the injured could all be brought in, and can only deal with a given number in a given time. In the Franco-German War the doctors had not finished their merciful work at Mars-la-Tour when they were wanted at Gravelotte. After days of work at Gravelotte they returned to the field at Mars-la-Tour, where they found men still living in agony with festering wounds. Others had ended a life hateful beyond imagination with their own hands. Among the list of missing, whose fate no man knows, there are many such tragedies. Those who creep for shelter from the sun to some copse or corn-field, who escape the anxious search of the ambulances, are the true victims of war. "In the burning heat of midday, in the dark shadows of midnight, crouched on stones and thistles in the stench of corpses around and of their own putrefying wounds,—a prey whilst quivering for the feasting vultures,"—without water, without food, without help of man to assuage their torments, what to them is the meaning of glory, and what in this life their reward? At Sadowa sixty wounded were found in a barn six days after the battle. They had lived God knows how. When found, the state of their wounds was such that not one of them could hope to survive. In the terrible battles in the Wilderness, during the Civil War, the woods caught fire as the two sides fought, and the wounded were consumed by the flames. Dreadful, perhaps; yet was this fate more dreadful than that of those who had crawled clear of the thickets and "were eaten alive by the beetles o'

nights"? "The wounded," says Wilkeson, "were haunted with the dread of fire. * * * Their hearts well-nigh ceased to beat when they thought they detected the smell of burning wood in the air. * * * I saw many wounded soldiers who hung on to their rifles, and whose intentions were clearly stamped on their pallid faces. I saw one man, both of whose legs were broken, lying on the ground with his cocked rifle by his side and his ramrod in his hand. * * * I knew he meant to kill himself in case of fire." At Cold Harbor the men who fell between the lines on the first day were left by either side to die. For war makes the human animal indifferent to others' pain and suffering and careless of the single life.

No wonder that with knowledge such as this, at the Geneva Conference, Mr. Twining proposed to end the miseries of the hopelessly wounded by giving the *coup de grace*. The time may come when such a measure will be permitted; now it shocks our squeamish humanity which cannot bear to read of such things, still less to think of them. The time, too, may come when we shall devise some means of saving life in a battle at sea, or arrive at some international agreement. When Mr. Wilson recently urged this necessity, a critic objected that those in battle-ships have other things to do than to rescue the drowning. As if it were not possible to have Red Cross vessels with each squadron whose one work should be life saving. But it seems governments and admiralities have no time for such merciful thoughts as these. Yet for bare economy's sake it will be mad folly to allow our precious sailors to be needlessly drowned: and it might lead to something very like the trial of the twelve generals at Athens.

Humanity condemns war altogether, and yet war persists. It has become more dreadful if slightly less bloody, with the advance of civilization. Shall we ever be rid of it? Not, perhaps, till the whole world is regenerated, and till anger and passion disappear from the hearts of men. It is, after all, only the continuous inevitable struggle for existence carried to its bitterest extreme and in its intensest form. We may, and with justice, denounce purely offensive war as wicked and unnecessary, but the old question will crop up, What is a purely offensive war? Peace, too, has its horrors: there are many employments and manufactures which exact a certain annual sacrifice to human life, and yet the shareholders in railways and electric-lighting works, the owners of white-lead works, are quite content to draw their profits. War is a national speculation upon a gigantic scale, and if the statesman of the Bismarck type sees profit to be made by it he will enter upon it without compunction. Peace societies by deprecating armaments only now do mischief to the nation where they make converts. Our sole road to peace with the present condition of the civilized world is to render attacks upon ourselves unlikely to succeed, and therefore inexpedient from a business point of view. Nothing is more dangerous than the unguided emotionalism which denounces armaments. Conscription by exposing every adult male to the risk of wounds or death will make even the armed nation reluctant to go to war.

The brutalizing effect of war upon the individual character is an ascertained fact. On the other hand, the training for war, as it is understood on the continent, brings great national advantages. It promotes physical well-

being by giving the recruit healthy out-door life at a critical period in his existence. It teaches discipline and obedience, virtues which are of immense value in civil life, and which in Germany have raised the efficiency of the working class to a remarkable extent. It does for the character what the primary school does for the intellect, and produces a stiffer and stronger type of man. Sooner or later, unless we have resort to it, we shall be driven from the field. Only by it can we fully man our navy as we ought, and only by it can we provide a strong army as we ought, and only by it can we provide a strong army to hold for us our dependencies in the hour of attack. By making such provision we shall be serving the cause of peace, and assuring the fulfilment of the prayer, "Give peace in our time, O Lord."

COVER, SCREEN, AND ILLUSION.

BY MAJOR M. MARTIN, R. E.

(Lecture delivered at the United Service Institution of India, on Friday, 29th May, 1896.)

BEFORE approaching the details of these subjects it may be advisable to touch very briefly on the larger conditions governing all field-works and all utilization of cover, as, being inseparable from strategy and tactics, there is always a great temptation to stray into these wider fields.

These large considerations have been recently so well treated by competent writers at home and abroad that it may be safe to assume the following propositions as governing the subject.

Strategically a defensive campaign is almost invariably disastrous, and small beginnings in defensive works have a tendency to grow into a purely passive resistance if allowed to control the plans of commanders, as at Sevastopol, Plevna, Metz, Placilla, Vina del Mar, and wherever entrenchment has formed the sole policy.

Tactically it is equally true that excessive resort to defensive works and cover has often caused a paralysis of offensive vigor acting injuriously both on the mobility and the *morale* of troops overaddicted to cover, and destroying their value for attack.

It may be assumed, therefore, that tactics absolutely overrule field engineering, and also that field cover and its provision or utilization is not the exclusive function of technical experts, but a part of the fighting tactics of all three arms, whenever applicable to the tactical purpose immediately to be pursued.

"Master the spirit of tactics," it has been said, "and the details of defense will come of themselves."

This paper only attempts to deal with details, subordinate to the spirit of the foregoing.

COVER.

While the principles of obtaining cover from fire must generally remain the same, and consist of interposing nowadays, as before, a more or less impenetrable mass or substance between ourselves and the enemy, it is probable that details of field cover will now need absolute modification in view of war against an enemy provided with the most modern artillery.

The causes of revolution are chiefly increased accuracy and range, but "cover" itself is more affected by the greater power and penetration of projectiles by improvements in fuse ignition, by the use of high explosives, and by the probable use of howitzers with more curve in the trajectory and throwing more powerful shells, common and shrapnel.

Shrapnel, originally a British invention, at first made its way somewhat slowly in continental armies, but at the present day its use and development abroad may wisely be assumed to equal the effectiveness of our own shrapnel.

Smokeless powder will give some slight extra concealment to both sides from counter observation, while generally increasing the accuracy and rapidity of artillery fire by the removal of the obscuration of the smoke.

Formerly, in artillery duels, the guns themselves suffered comparatively little loss. Great losses have usually been in men and horses, and these have compelled the withdrawal of the guns, usually uninjured.

With high explosives it will be more common for the guns themselves to be destroyed or disabled, and this perhaps will somewhat shorten the artillery duel, and render infantry action possible at an earlier stage.

It may be possible to overrate the power of modern artillery as well as to underrate it, or fail to calculate the advances made in that arm.

One writer anticipates that in the next war we shall see half an army corps put out of action in a short time, by the fire of artillery alone.

Another more moderate exponent says "Skeptics as to the power of modern artillery would be at once converted could they see 100 guns in one line, under one control, occupying a frontage of one mile and distributing their fire as required to every point in the field, varying the nature and object of the massed fire as the controlling head may direct.

It is some such concentrated and increasingly powerful effect which may now be expected from an opponent's artillery and it would seem, therefore, that the protection afforded by walls, buildings, and revetted works, will specially need revision as adjuncts to field defense. Earthwork, etc., admits of easier modification to present conditions by adapting it to the scale of penetration (as far as time will allow of such greatly increased labor), but cover actually standing will always be useful provided it still affords a protection and does not add to the destructive effects of fire. See Fig. 1.

For instance, a house or high brick wall of $1\frac{1}{2}$ brick thickness now becomes worse than no shelter at all, if its occupation be known to the enemy, for it is evident that under modern shell fire the effects of a bursting shell are doubled by the flying fragments of masonry, crumbling roofs and falling beams adding to the confusion and alarm.

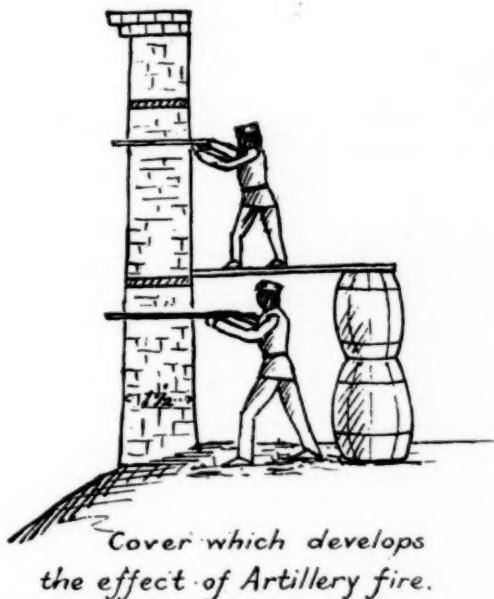
It would even appear that common shell charged with high explosives

requires weak cover to develop its full effect, for it is said to be less destructive to infantry in the open than is shrapnel.

On the other hand where a building is of the average strength of a church, its walls will continue to afford protection to the inmates from field artillery, and hence classification becomes increasingly necessary.

But while the direct lining of thin walls by artillery and infantry would now seem to be worse than no protection, it does not follow that even weak walls and houses offer no protection in any position. On the

Fig. 1.



contrary they would still protect sensibly the flank of any troops at some slight distance from them, and even if easily demolished would require time and expenditure of ammunition to destroy before the flank became again vulnerable.

It is also probable that a house once reduced to a heap of *débris*, would then become more tenable by infantry as a heap than it was before as a shell trap.

This again leads us to the question whether it is now always worth our while to level all houses around a defensive position, since by so doing the

demolished houses might give better cover to the enemy than they did when standing?

As regards the tactical utilization of standing houses and high weak walls by advancing artillery, it would sometimes appear feasible to interpose such between themselves and a hostile battery, still keeping their immediate front clear for fire on the enemy's infantry or other detailed objective; but the protection must be carefully thought out, or it may prove delusive. See Fig. 2.

Fig. 2.



In 1870 a French battery of horse artillery was engaged after selecting as a position a line of poplars, the thick trunks of which afforded at their bases good cover for the gunners; but after an interval the enemy's shells (fired with percussion fuses) were found to have nearly exterminated the limbers and wagons to the rear.

This was of course due to the shells bursting on contact with the boughs of the poplars, and from thence the splinters ranged well for the teams and wagons as they were placed. This is an instance of very defective cover which would often require careful watching to avoid.

Such an effect might as easily be reaped from the ridge of a high pitched roof or any penetrable screen which just bursts a shell conveniently for the enemy, and it would appear that officers should avoid halting troops 100 to 150 yards in rear of any screen that will just serve to burst a shell.

Again it is probable that the occupation of the *lisiere* or border of a thick wood would now be a most delusive protection from artillery fire as falling limbs and branches would largely multiply the ordinary effects of shell fire on the supports and reserves in the wood behind.

The whole question of forest defense appears to be one little studied or provided for in the British service. In this matter as in other defensive works we are apt to assume lightly that troops can easily perform individual tasks which are in reality immense.

It is often recommended to form clearances which would involve felling many acres of forest, and though gun-cotton necklaces might be partially employed, the majority of the trees would have to be felled by the axe. Our

British battalions have few axes and little practice in their use, and the work would probably disappoint expectation. Canadian or Australian lumbermen or backwoodsmen would give an excellent result, but it would be useless to expect much skill at the axe from a young British battalion raised perhaps from a midland town and consisting (as one of them does) almost wholly of shoemakers! Others would be weavers, machinists, etc., according to the trade in the town where the battalion is raised.

Foreign nations have a larger element of forest born recruits, better fitted to deal with such eventualities, and this is true of America also; but we can never be sure a future campaign will not be in forest country, and it would appear advisable to develop the existing organization of infantry pioneers so as to act as instructors to a larger proportion of the bulk of the infantry. This system is indeed laid down in the Queen's Regulations, but little has been found possible, far less has it been found feasible to develop further the system of instruction foreshadowed.

In this connection it seems rather an error to suppose that picks and shovels are the sole tools useful to infantry. It all depends on the country. In many cases axes and saws would be far more useful. In a loose sandy desert, for example, picks would have no value, etc.

The conditions and circumstances of the country of campaign govern largely both the instruction necessary and the needful equipment. It has been said that a good officer for an engineer park, for instance, is one who, starting with a full equipment, knows what to throw away, and when it would be advisable to do so!

The outer edge of a village towards the enemy would seem only to invite common shell with high explosives nowadays.

Noisville and St. Privât, though strongly built, were easily destroyed by the Prussian artillery of 1870.

Authorities agree in recommending as a defense a thin firing line slightly in advance of the village, which, from the enemy's position, would be undistinguishable from the actual occupation of the outer edge, combined with a strong occupation of the near half as an interior retrenchment, and if supported by guns these should be placed on the flanks clear of the village itself. See Fig. 3.

Such a scheme of defense is a mixture of cover and screen, the advanced half of the village A and B being surrendered to the enemy's artillery, and should this half be destroyed by fire with flat trajectories, it would probably form when levelled a screen and glacis for the interior retrenchment C and D, and the assaulting columns of infantry would find the post still tenable and, possibly, even strengthened, by the enemy's direct fire.

This would not be the case with curved fire from howitzers, and the weakness of direct fire in dealing with skilful defenses has pointed to a probable larger employment of the howitzer, and has directly led to the use of high explosives in shells.

The defenses of Plevna caused the Russians to raise their artillery force to the proportion of 8 guns per thousand infantry, an almost unheard of average, and, when the march on Constantinople commenced and continued, a large proportion of this artillery had to be left behind. It is prob-

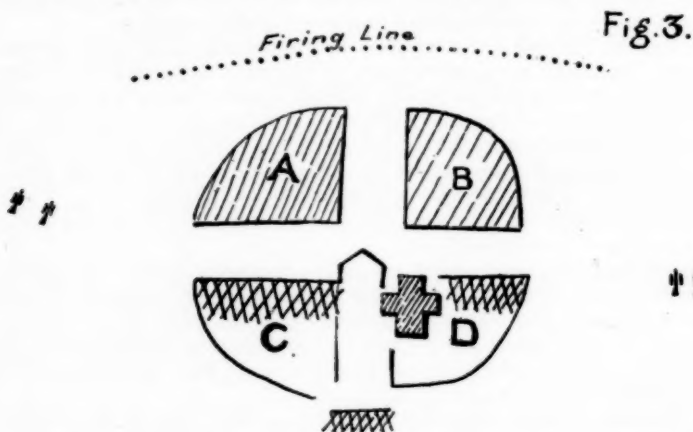
able, therefore, that in future wars every effort will be made to bring a very large artillery force into action in the first engagement, especially against a defensive position, and this force will, it is said, comprise besides howitzers, guns stronger than ordinary field or even position artillery.

Besides the weight of such guns themselves, increased power in shells means increased difficulty in transport, and the heavier natures of ordnance may have to be abandoned if the subsequent campaign becomes one of march and manœuvre.

Such conditions will react on "cover" and affect its use.

Hitherto high explosives have not been considered absolutely safe in transport, though they were both carried and used by the French mountain artillery in the Madagascar campaign with absolutely shattering effect against the Malagasy positions, which were hastily abandoned under such novel stress, a stress which will prove trying to far more seasoned troops than the Hovas.

Probably one of the most delusive forms of protection that seems to offer itself is the reverse slope of a hill. Such a slope often coincides with



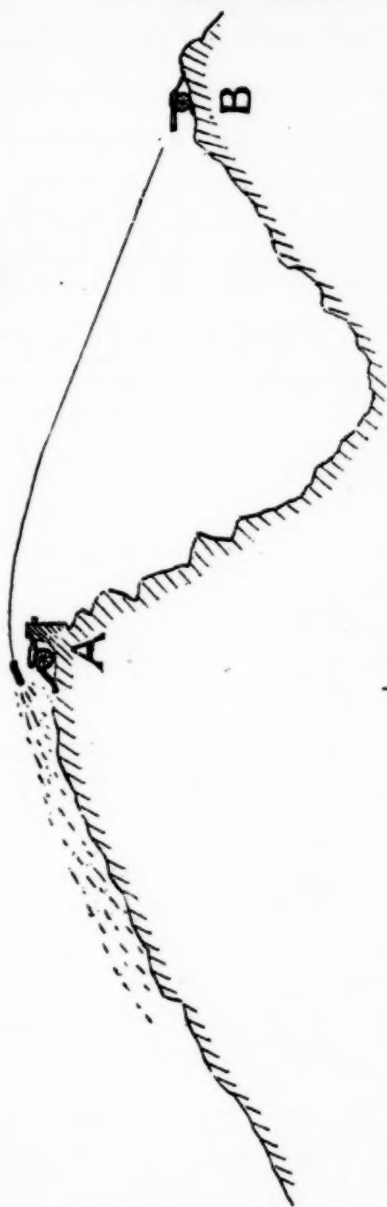
a falling trajectory and adds to the loss sustained, although from the reverse slope the enemy is invisible, and it would in the old days have been held to be defiladed from him.

Such a case occurred at the action of Tashkessen, which I propose to notice later, on other grounds. See Fig. 4.

A Turkish battery at A was engaged with a Russian at B and suffered the most of the two. The Russian trajectory searched the higher position, and the Turkish fire was plunging and therefore little destructive, yet by general rule the Turkish position was "defiladed" and the Russian position absurd. In practice General Baker was surprised to find the results entirely contrary to his expectation.

The enemy's artillery may be supposed to be in action at many and

Fig. 4.



varying ranges, giving varying falling trajectories, and as howitzers have a steeper falling trajectory than ordinary field-guns, a slope which protects from one given fire, may be searched by another, and general opinion now seems to point to the impossibility of providing in the field head cover of sufficient strength to resist common shell with high explosives, if indeed such cover would not add to its destructiveness.

Earthworks with increased thicknesses will give the same protection as before. Some authorities desire to double the thickness, in order that a single shell may not sweep away the whole cover at any particular point. Others abandon the contest and desire only lighter cover to resist infantry fire and shrapnel.

As regards natures of soil, while clay or hard soil can be blown away by shells in pieces, light soils or sand are less destructible, as shells bury themselves therein, and, even if they explode, form a

temporary crater into which much of the expelled sand falls back again, leaving the parapet much as before.

Shells with delay action fuses are more apt to become buried than those fired with direct action ignition.

It may appear superfluous to refer to snow as a protection were it not that history points to so many examples of actions fought on snow. Leaving out mountain ranges (which are frequently disputed) it would appear as if campaigns begun in the spring or summer, are often prolonged beyond expectation till winter sets in, and thus without going back to Hohenlinden, we find the campaigns of the Crimea, of Paris, of the Loire, and of the Russo-Turkish War, all prolonged into the winter, and snow therefore a factor.

A snow parapet is therefore by no means an impossible or unlikely factor in defense, and though I believe the test has not been tried, it is quite conceivable that a shell which was gradually deprived of its momentum would not explode but be smothered, thus giving a greater advantage to this form of protection.

Marshy or loose sandy ground in front of a position will probably be, relatively, a greater protection than formerly, as the smothering of shells having a wider radius of destruction will be increasingly important.

I have purposely avoided so far, any consideration of musketry, partly because protection from shell fire includes protection from musketry; but more because it would seem impossible to maintain troops in purely musket proof cover during the preliminary artillery action, where their presence is known or can be ascertained, and if Captain Maude is right in assuming that half an army corps may nowadays be rapidly annihilated by artillery fire alone, it would appear that the infantry action may be allowed to take whatever course is possible, after the artillery is subdued or exhausted wholly or partially. Into this phase of the action the same guiding conditions will not enter, and cover which is unsuitable, while under artillery fire, may again be utilized and always may be utilized when unseen or unguessed, or to gain certain advantages in defiance of the risks.

These risks we had best understand to value duly.

Artillery can never replace infantry, and I should have added to the postulates of this lecture by saying it is only held to prepare for the action of infantry when possible.

This prescribes a probation of impossibility for the infantry, during which, however, it must move to such positions as it can act from, exposed to some certain artillery fire, and a further uncertain amount which it hopes to dodge or avoid incurring. Actual infantry bullet fire, while it has enormously gained in range and intensity, and to a certain extent in penetration, cannot be said to have revolutionized the profiles of cover necessary for intrenchments, villages, etc.

Our own army has had no recent experience of meeting artillery fire in the field, and it will require not only great forethought, but will form our first consideration how to deal with the artillery phase of the action, utilizing cover as tactics may dictate, and never forcing the tactical con-

sideration into subordination to academic perfection of defensive details.

From the foregoing it would seem advisable first, to eliminate from our books and courses of instruction all models and details which have become not only obsolete but positively dangerous; second, to carefully discriminate between war against a savage enemy consisting of infantry alone, or infantry and cavalry; and third, it would appear that these details of cover should be dealt with more in a tactical spirit and with reference to the two kinds of warfare in separate columns, as otherwise one paragraph must be corrected by the next to qualify the use for which any particular model is suitable.

As, with your permission, I propose to deal shortly with the protection to and from artillery by "screen" and "illusion" I will only lightly consider "cover" as required in savage warfare.

Here our experience has been recent and thorough,

The siege of Chitral reads much like a chapter of mediæval romance; we hear of the water tower and the close approaches, and doubtless the garrison would have welcomed moat, barbican, and portcullis, had they been thoughtfully provided by their predecessors. The employment of advanced fires to light up the enemy and obscure the defenders was both curious and instructive, and was a makeshift use of the same principle which we may expect to see further developed in the use of the electric light.

In various climes we have learnt to know the laager and the zareeba, the sangar, and the boorj, and to adapt them to our own use.

One great principle runs through all these defenses however.

Under artillery fire they would all be shell traps either from the material of their construction or the closed formation of the troops occupying them, but when rushes of overwhelming masses armed with the sword or assegai have to be met, protection takes the form of a high wall, thorny fence, or delaying obstacle or entanglement, and the spade and earthwork are comparatively useless and indeed should be almost forgotten, earthworks *per se*, being most easily rushed, as were nearly all our posts between Chaman and Candahar after the reverse of Maiwand.

This last appears an example of officers taking models from the books to oppose rushes, where the model is only designed to minimize infantry fire; and is an instance in point as to a more tactical arrangement of class books on fortification being needed.

All countries do not offer the same possibilities for erecting zareebas (where thorns are required) or stone walls, which last are not easily erected rapidly of sufficient height to keep out a rush.

Where boulders and thorns are both available, there is a possibility of making a wall very rapidly which is commonly used in the Meranzai valley, but perhaps not so generally known as it deserves to be. See Fig. 5.

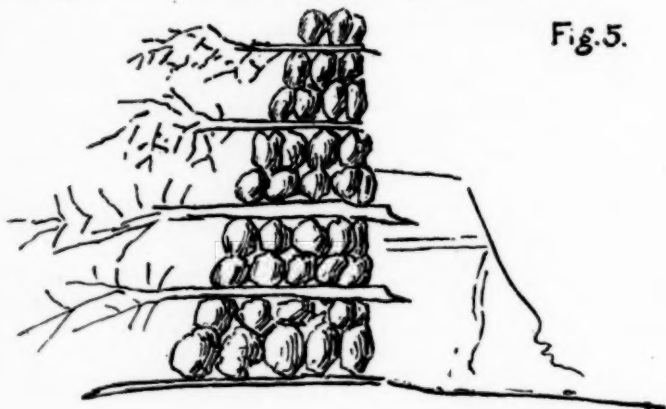
A boulder wall is made 3 feet thick and 2 feet high. Branches of thorn are then laid over it, the butts inwards and the thorns towards the enemy, binding the boulders together. Two more feet of boulders are added, then another layer of thorn and so on, tapering the wall slightly. The whole is raised to 9 or 13 feet and forms an excellent protection from a rush. This

wall however would be an example of the worst cover one could possibly provide against artillery, when such 'a neighborhood would be most undesirable.

It sometimes falls to the lot of officers in savage warfare to consider the question of cover for pickets on difficult and broken ground. This is a vexed question, and it is most questionable whether entrenchment is usually desirable for pickets at all under such circumstances.

They become less watchful, are sometimes inclined to line the entrenchment and fire without cause, they hold their ground perhaps after their flanks are turned and become isolated, and, by absolutely fixing the position of the picket, very tangled ground may be less perfectly watched.

Where required to fight a delaying action, rather than to watch, cover would be desirable, and in this respect again, savage and civilized warfare would appear, as a general rule, to point to opposite measures.



Miranzai Wall

Obviously "trace" is less affected by modern improvements and remains roughly the same, while "sections" or "profiles" are greatly modified.

The next consideration I have endeavored to lay before you for discussion is that of—

SCREEN.

When it became obvious that, both in permanent and field fortification, no structure could be erected which could not ultimately be pulverized by artillery, there were not wanting officers who prophesied that the future fortifications would be of paper or canvas, merely to screen from view, avoiding structures which were only blown about one's ears. This view is, of course, fallacious, as fortifications are meant to protect for a time, delaying the enemy, and absorbing time and means even if eventually reduced, but there is more than a grain of truth in the suggestion that it is most important to screen from sight and observation.

In coast-defenses much work is now expended in defeating observation,

sometimes by planting trees and creepers, by coloring, by studiously confusing crest lines, and obliterating traces of recent earth-work.

Dover Castle is a good example of successful concealment, as any one may test by trying to pick out the position of the guns on that height when crossing from Calais. The western heights, on the contrary, are rather plainly detected, and the gun emplacements can at any rate be guessed.

In the field use of artillery, it may be possible to adopt some variations of these methods of screening to obscure the position of batteries, and with smokeless powder observation will become more difficult.

Hurdles, for instance, would form a screen not subject to the disadvantages of a brick or stone wall under fire, and it is possible that canvas screens of a suitable tint might be used both for the guns and the ranging parties, especially where natural cover does not exist and where, as in the desert, mirage assists to defeat observation.

Sir George Clarke says "against artillery fire invisibility is the best form of protection, and even when the field howitzer makes its appearance, well-concealed defenses will have little to fear."

Balloons of course may aid in discovering concealed defenses, but, generally speaking, at the present ranges, observation is most difficult and the presence or approach of artillery is more guessed at by indications than actually foreseen.

Long columns on a road, high thick clouds of dust, small ranging parties, are seized on as betraying the action of guns to follow, but all of these can sometimes be screened, and all of them can be imitated in wrong positions so as to aid in confusing the enemy.

All sportsmen who have used a glass in detecting game on a hill side at some distance, know what a difficult and protracted task it is and what special aptitude it involves. It is so easy to mistake one indication for another, a branch for an antler, a bear for the shadow of a rock, or what not, and the resemblance of an alligator to a log of wood is well known. See Fig. 6.

Hence, surely, where we have a ready means of deceiving an enemy by screening and illusion, and no effectual mechanical means of resisting his artillery fire when once brought to bear, we should utilize all measures for obscuring our own forces, simulating strength elsewhere and frustrating the enemy's purposes by every feint and concealment available.

Screens are formed frequently enough of cavalry, light troops, or of all arms; and a good instance of this last form of screen is found in the action of Tashkessen, which is further interesting as the last occasion on which a British officer commanded in an action against European artillery—the most recent, and yet nearly twenty years ago—and in addition, it illustrates the possibility of material force being arrested by skill, character, and determination.

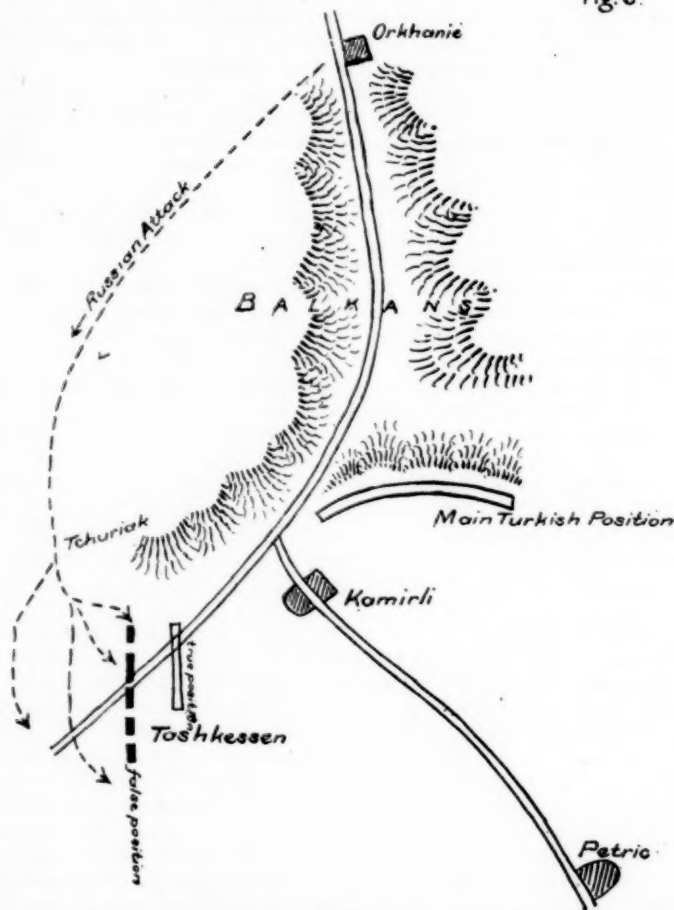
The causes that led to this action may be rapidly summarized.

Shakir Pasha with a Turkish army corps was holding the pass through the Etropol Balkans served by the road from Orkhanie to Kamirli, at which latter position his force was entrenched. After the fall of Plevna, Gourko succeeded in turning this pass by utilizing the mountain paths by Tchuriak,

and debouching on the plain succeeded in threatening the retreat of Shakir on Petric.

To delay Gourko, General Baker with a small force of 3000 men and 5 guns took up a position at Tashkessen and forced an action, although his position could have been turned.

Fig. 6.



As it was only necessary to hold out till the evening of the 29th December, 1877, Baker occupied two positions, a false one in advance, and a real one a mile in rear separated by a valley.

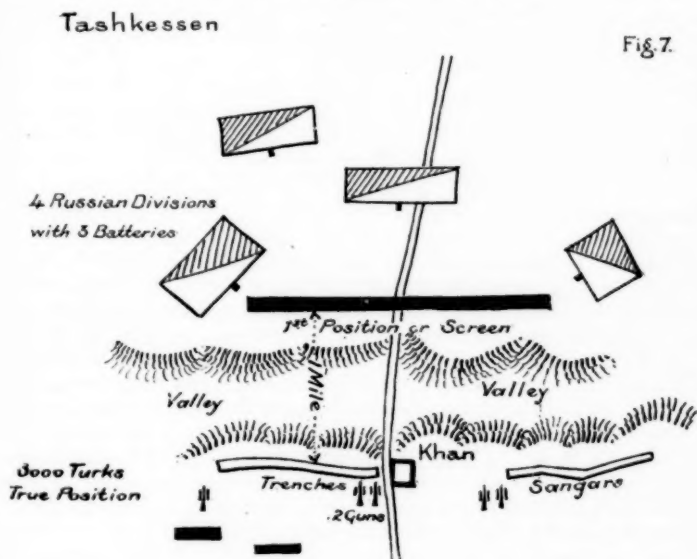
To his great joy Gourko deployed nearly 40,000 men and 3 batteries to attack the false position, sending a division to each flank to thoroughly en-

velop it, and the hope then occurred to Baker that if these large forces arrived massed and disordered in the advanced position (really a screen) he might from the real one be able to repulse them, though the odds stood at $12\frac{1}{2}$ to one. Baker's original plan was the defense of successive positions, but the one suggested by Gourko's premature attack was evidently better.

The attack began at daybreak, and by half-past 12 Baker had retired to the main position, which was entrenched, having $4\frac{1}{2}$ hours of daylight to hold out, and the attacking force being clumped and difficult to extricate for even a fresh front attack, still less to form fresh flanking columns.

Baker's position was on both flanks of the road, commanding which was a strongly built "Khan" or Traveller's Serai, fit to resist field artillery and in which he placed 4 companies. See Fig. 7.

Close by in a yard he hid 2 mountain guns, which, being masked, acted subsequently with the force of a surprise. See Fig. 8.



On his left his battalions were able to entrench and used the Turkish trench. This form had been found capable of withstanding both infantry and artillery fire and cannot easily be improved upon. A small shelf or berme, however, might be added near the crest, to rest the elbow on, give better cover to the man, and hold his loose cartridges. It is necessary to avoid allowing this trench to be made too deep as the men then sky all their cartridges.

On Baker's right the ground was too stony to trench, but he permitted the erection of stone walls which he knew would be harmful under artillery fire, sooner than lose all protection against bullets.

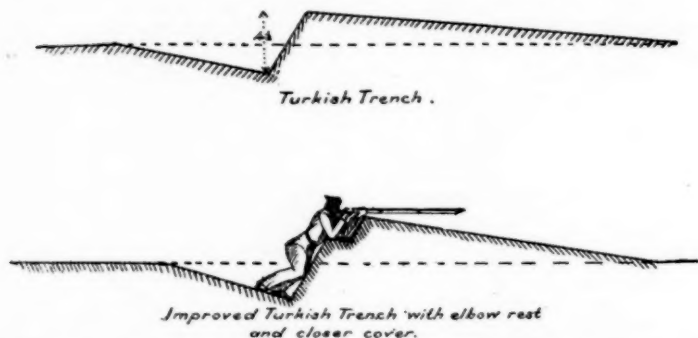
In the case this was a wise decision, but each case must stand by itself, and here a great portion of the Russian artillery was diverted to Kamirli.

The defense held out till nightfall, and after losing about half of its total force, had sufficient vitality to repulse a final charge of the Russian Guard with the bayonet after an action of 10 hours, which combined active manœuvring with a very trying passive defense.

Baker here employed cover, screen and illusion, and gave a further instance of the last before his retirement during the night.

The opposing sentries were only at 20 yards distance, and the Turks sub-

Fig 8



stituted dummy ones with perfect success and effected their junction with Shakir at Petric unmolested.

It turned out afterwards that Gourko had further been deluded by telegrams found in the office he seized into supposing that he had the main Turkish force in front of him, otherwise he could have easily retained Baker and spared a force to seize the Acha Kamirli defile and cut off Shakir.

Since the Russo-Turkish campaign, artillery has made enormous advances, and if at that time it was several times possible to compel the surrender of large bodies of men entrenched by shrapnel fire alone, the possibilities of its future action are hard to over estimate.

CAVALRY ARMAMENT.

BY LIEUTENANT-COLONEL P. NEVILLE, 14TH BENGAL LANCERS.

(From *The Journal of the United Service Institution of India*.)

"Superiority of armament gives increased chances of victory in war. It does not of itself gain battles, but it is a decided element of success."—JOMINI.

THE question of the best armament for cavalry is one which has for centuries occupied the attention of military authorities in all the great powers of Europe, and, strange to say, it is a question which does not seem even yet to be definitely and satisfactorily settled. The principal point at issue is, putting minor points aside, whether the lance or the sword is the better weapon, and, as a side issue, whether the front ranks should not be armed with the lance and the rear ranks with the sword. There seem to have been at various times epidemics, so to speak, of enthusiasm for one or the other arm. We see nations discarding the sword for the lance at one period of their history, and at another reverting to the sword and carbine.

Germany at present favors the lance, and in India, during the past quarter century, a number of native cavalry regiments have discarded their national tulwár for a lancer armament.

No living writer has gone more thoroughly into this subject, or brought a greater battery of erudition to bear upon it, than Lieutenant-Colonel Elliot, commanding the 3d Bengal Cavalry; and in this short paper (for I have no intention, even if I had the ability, of dealing exhaustively with so wide a subject) I shall make frequent quotations from his pamphlet published in 1890 and entitled "Notes on Cavalry Literature, treating more especially of its armament."

Colonel Elliot's conclusion is that the lance is the more suitable weapon for the shock, and the sword for the subsequent *mêlée*.

In this most cavalrymen will agree, but here we are but at the commencement of the problem, which really is, how the same man may be enabled to first attack with the lance and immediately afterwards employ the sword as his weapon. Going back to the middle ages we find the heavy-armed knights charging in line, armed with very long and heavy lances. They were followed at some 40 or 50 paces by a second line composed of their esquires and men-at-arms who carried swords. If the charge was successful, this second line, joining in the *mêlée*, helped to complete the victory; if, on the other hand, the knights suffered a reverse, they were enabled to rally and re-form behind this second line. It will be remarked also by the student of history that, after the first shock, the knights discarded the heavy lance and laid about them stoutly with mace, battle-axe, or sword.

Before considering the three-fold question—*i. e.*, lance in both ranks, sword in both ranks, or lance in front and sword in rear ranks—I will give some quotations from Colonel Elliot's book to show the various opinions of recognized authorities on the subject; and by authorities I mean not

only writers who have devoted time and study to the subject, but also and more especially men who have been expert leaders of large bodies of cavalry in the field, and whose *dicta* are based on actual experience in war.

In 1811, Napoleon, by a decree dated the 11th November of that year, attached a regiment of lancers to each division of cuirassiers, thus recognizing the principle that the lance is useful in the front rank only.

In "Les Tendances actuelles de la Cavalerie Russe," by Sainte Chapelle, Paris, 1886, a full account of the recent transformation of the Russian cavalry is given, from which it appears that by a ministerial decision, dated April, 1883, the regiments of Don Cossacks have preserved the lance, but in the front rank only. The commission charged with the inquiry on this subject give the following reasons in support of their decision:—"If the horsemen of both ranks have the lance, the result in a charge will be as follows: At the moment of impact, either the front-rank man will strike his adversary and leave the lance in his body, or if he has missed, it will be because the latter has taken off the point of his weapon with his sword. In either case the lancer will find himself unharmed in the *mêlée*; and, *a fortiori*, the rear-rank man, who charges with his lance carried and disengaged from the boat, will be disarmed also; whilst if the front rank only have the lance, the rear-rank man, charging sword in hand, will be able to come up to the support of their front-rank men."

An article entitled "Les Transformations de la Cavalerie" in the *Revue de Cavalerie*, 1886, gives a full account of lancers and their suppression in the French and Austrian armies. The writer is an enthusiast for the lance. In 1870, towards the end of the Franco-Prussian War, the Colonel of the 5th Lancers telegraphed to Paris for permission to discard his lances and use rifles instead, on the ground that he could not perform properly outpost duties in front of the army. General de Laverdo, of the Ministry of War, telegraphed in reply—"Prenez modèle, pour éclairer l'armée, sur les Uhlans Prussiens, qui sont armés de lances."

Marmont favored the lance for the front rank only:—"Il faudrait en armer le premier rang de tous les régiments de ligne et de grosse cavalerie."

Latour-Maubourg, at the battle of Dresden, 27th August, 1813, made repeated attacks on the Austrian squares, but failed in them all until he placed fifty lancers of his personal escort in front of the cuirassiers. These lancers made a breach in several squares, through which the cuirassiers poured, and so broke the left wing of the Austrian army.

In an article, "Encore la Lance," in the *Revue de Cavalerie*, 1890, the writer says: "In Germany up to the present time there were only 25 regiments, out of a total of 93, armed with the lance. Under recent orders issued by the Emperor, there are now 35 equipped with the new armament, and 39 if the four regiments of heavy Saxon and Bavarian cavalry are also to receive the lance." Quoting Lieutenant-Colonel Elias, of the English army, he says: "Quoi qu'il en soit, l'opinion de ceux qui conseillent d'armer le premier rang de lances mérite d'être examinée. Pour nous, Anglais, qui avons si souvent à combattre contre des Afghans, des Arabes, et autres guerriers Asiatiques courageux, il est vrai, mais pourvus de mauvaises armes à feu la lance serait d'une grande utilité, car ces ennemis se couchent

à terre dans le mêlée il ils deviennent dangereux dans cette position où le cavalier ne peut les atteindre avec son sabre."

The truth of this was proved very decidedly in the Afghan campaign of 1879-80. The enemy threw themselves down when charged by cavalry and slashed up with their heavy knives as the cavalry passed over them, inflicting in numerous cases mortal wounds on our men. Swordsmen were unable to reach them with their sabres, but our lancers gave such a good account of the enemy that they quickly learned to dread the lance, which is undoubtedly the "Queen of weapons" when employed against infantry.

"So far as native horsemen are concerned," writes Colonel Elliot, "it is absolutely necessary to eradicate from their minds the feeling that they are 'incapable of it.' They know (few better) the difference between a sharp tulwâr and a blunt sword. They know from personal experience what the lance can do and what it cannot do. Some day these men may be called upon to face the fire of magazine rifles. To do this with any chance of success, they must feel and know that they have the best armament in the world, and not the second best only. Second best armament means second best troops, and as it costs no more to feed and pay the best than the second best troops, a wise policy would seem to be to consider these matters while it is day. * * * Asiatics have in all ages and in all countries supplied their want of physical strength (as compared with Europeans) by the very simple process of never using edged weapons, such as swords, knives, daggers, scimitars, etc., unless they had a razor-like edge, and with which, from their natural construction, they can inflict terrible wounds. The Hindustani tulwâr, Mameluke sabre, Afghan knife, Malay creese, Ghoorka kukri, Turkish scimitar, Albanian yataghan, Persian sabre, Japanese sword, are all practical examples of the truth of the above statement. * * * Nolan quotes many instances which tend to show that irregulars armed with sharp swords, and having a proper command over their horses, have over and over again severely punished English dragoons of far greater physical strength and moral courage than themselves."

The above goes to prove that if cavalry are to be armed with the sword, the sword must be sharp, and not the blunt steel bar which is in vogue in our army to-day. This is of little use except to parry, unless when placed in the hands of a second Samson, who, it may be remarked, might do as good execution with his traditional jaw-bone of an ass.

Wellington was of opinion that the rear rank at close order was of no use to the front rank:—"I think that the second rank of cavalry at the usual distance of close order does not increase its activity. The rear rank does not strengthen the front rank, as the centre and rear ranks do the front rank of infantry. The rear rank of the cavalry can augment the activity, or even the means of attack, of the front rank, only by a movement of disorder." This tends to prove that our present system of charging with the rear rank at close order is vicious and unsound. If this be true for hussars it is doubly so for lancers, for the rear-rank lancer, charging at full speed eight feet in rear of his front-rank man with his lance at the "carry" in the bucket, is not only practically helpless and useless at the moment of impact, but also he is a source of danger to his front-rank

man.* Jomini, Marmont, Roche-Aymon, Okouneff, all are in favor of the lance in the front rank only. Saxe, Poniatowski, Latour-Maubourg, De-Brack, Roginat, Gouvion St. Cyr, Foy, Morand, Colbert, Pajol, and Napoleon recommend the use of the lance and sword in conjunction, each weapon in its proper place, the one supplementing and correcting the defects of the other.

Sir Charles Napier looked on native horsemen as men of the sword, and was of opinion that their own national tulwár was for them the best weapon. He was dead against "dragooning" the irregular cavalry of India. He did all he could to ridicule the idea that Asiatic horsemen could be expected to become the counterpart or duplicate copy of English dragoons, but, as he says, in his letters, without the least success.

The events of 1857 swept away in one day the regular native cavalry with their blunt swords, long stirrups, and slippery saddles, to be replaced by corps like those commanded by Probyn and Hodson, whose men, being left to choose their own horses, saddlery, weapons, etc., according to their native ideas of what was really suitable, very soon convinced all concerned before Delhi and Lucknow that the wisest policy is to recognize the fact that the irregular native horseman has one way of fighting:—and the European dragoon another.

These modes of fighting, utterly distinct, are well contrasted by Nolan.

"As Sir Charles Napier said, the European trooper's downright blow splits the skull; the native sowar has, as a rule, neither the strength nor the nerve for this style of warfare, so he, with cunning artifice, instead of brute force, arrives at the same object by a delicate drawing cut (from the wrist) across a limb, which in nine cases out of ten severs some artery or blood-vessel. The result is the same, though the weapons employed are quite different."

Sir Charles Napier, writing on the subject, says: "The slicing of the Eastern horseman's razor-like scimitar is terrible."

"The Book of the Sword," by Sir Richard Burton, 1884, is a masterpiece on the subject. Of curved or straight swords the author says: "The straight sword, used for thrusting, is hard to handle when the horse moves swiftly, and the broad straight blade loses its value by the length of the plane through which it has to travel. On the other hand, the bent blade collects, like the battle-axe, all the momentum at the 'half weak,' or centre of percussion, where the curve is greatest. Lastly, the drawing cut would be easier to the mounted man and would most injure his enemy."

"This dictum," says Colonel Elliot, "finally disposes of the popular fallacy that a straight sword is best for a mounted man. It is the best for a man on foot in the shape of a rapier, but introduce the horse into the question and the conditions are altered at once, as Burton clearly explains.

* * * The tulwár, or half-curved sword of Hindustan, cuts as though it were four times as broad and only one-fourth of the thickness of the straight

* A British cavalry officer who has served many years with both hussars and lancers writes:—"I can assure you that when the 'charge' sounds for a real conflict, the rear-rank men bring their lances to the 'engage' also; not likely men are going into an enemy with their lances at the 'carry.' If they had swords it would do away with the above danger."

blade. But the 'drawing cut' has the additional advantage of deepening the wound and cutting into the bone. Hence men of inferior strength and stature used their blades in a manner that not a little astonished and disgusted our soldiers in the Sind and Sikh campaigns."

There can be little doubt that against infantry the lance is the best weapon for both ranks, but in cases where the sword, scimitar, or other cutting weapon is the national arm of the troops, it would seem a doubtful policy (at all events in the case of Asiatic troops expert in the use of the sword) to replace this by the lance, which is a weapon requiring great strength of arm to wield successfully, and, as we have seen, Asiatics have not the strength or nerve of Europeans in the fight.

That the sword may be victoriously employed against infantry is demonstrated by current events in Cuba, where the inhabitants are engaged in a fierce struggle for liberty against the Spaniards. In *The Illustrated American* of April 25, 1896, there is an interesting article on the "Machete," Cuba's favorite weapon:

"While military experts have been telling us for years that the new conditions of modern warfare have made the cavalry charges obsolete, we read nearly every day of Cuban victories won by cavalry wielding the 'terrible machete.' This machete (pronounced 'machetty') is the implement for all needs throughout Spanish America. This blade is first cousin to the sabre of our own cavalry, but while the sabre serves only for one purpose, the machete serves many, and is as useful in peace as in war. Almost every Spanish American above the age of childhood carries a machete. With this the laborer cuts his sugar-cane, prepares firewood, and trenches the ground for his crops. The horseman wears the machete because with this he cuts his way through the woodlands during journeys over rough country. It is sword, spade, and hedging bill, axe, hatchet, and pruning knife. You may have the machete in nearly thirty different forms. * * * Two things have made cavalry conspicuous in the Cuban war, at a time when men had begun to think of the cavalry sabre as sure to take its place with the lance among the weapons of the past. First, every Cuban owns a machete and may own a horse. Given 50 Cubans with horse and machete, and you have for purposes of this war an effective troop of cavalry. Again, nearly every engagement of the war has been fought on rough ground where the infantry hollow square could not be effectively formed.

"Cavalry can rarely penetrate the square of infantry, bristling with bayonets and ready to pour volley after volley into an advancing foe. But, on the other hand, infantry, formed as troops must be upon the rough Cuban battle-fields, cannot easily withstand the charge of cavalry armed with the terrible machete."

A glance at the present state of affairs in Cuba will show how much the insurgents have effected, principally by their cavalry. The rebel army numbers about 40,000 men, who have only a limited amount of ammunition obtained chiefly from abroad. The Spanish army consists of 135,000 regular troops of all arms and 40,000 volunteers drawn from Spanish residents of the island. And yet at the present moment the Spaniards are acting purely on the defensive. Most of their troops are locked up in garrisons

along a line of 22 miles extending from the outskirts of Havana to the southern coast in the vicinity of Mariel. In the meanwhile the rebel chief Antonio Maceo remains quietly in Pinar del Rio awaiting further supplies of ammunition from the United States before again assuming the offensive.

Given, then, for the sake of argument, that the lance is the best arm for cavalry when opposed to infantry, it would follow that divisional cavalry should have the lance in both ranks; and as for attack formation, several lines in single rank would seem to be the best adapted for the purpose. For the independent cavalry division acting at a distance ahead of the army against the enemy's cavalry, the consensus of opinion is in favor of one armament of about equal lances and swords, but the question still is most how best they may be distributed.

Shall we have brigades consisting of one lancer and one hussar or dragoon regiment, the whole acting in single rank? The Duke of Wellington was a great advocate for the rank-entire system, and so have been many other distinguished soldiers. If we adopt such an organization, the lancers must form the attacking line, and the hussars, riding some 50 paces in rear, must take the place of the present rear rank. The drawback to this arrangement is obvious. The two ranks belonging to different regiments and having different commanders, would no longer be homogeneous; there would be no unity of command. It might succeed for an attacking, or first-line brigade, riding straight to its front; but for the supports and reserve, where sudden formations for offense or defense must be rapidly assumed, or where units have to be thrown into the fight at various points, unforeseen, the multiplicity of commands and the difficulty of manœuvre combine to condemn such an organization.

Shall we adopt the system of lances in the front rank and swords in the rear? This at first sight would seem to be a solution of the difficulty. It most closely resembles the tactics of the middle ages. The front rank might, after charging, if the *mêlée* were too crowded to give them free scope for their weapons, copy the knights of old, and, discarding the lance, draw their swords. If they were victorious there would in all probability be ample opportunity for recovering their lances after the fight. This system, however, presents the difficulty that in every home charge a certain number of lances are always broken or lost. This has been estimated at about 12 per cent., so that after about eight charges—not too many for a regiment to expect in, say, a week's campaign—there would be no lances left. It might be possible in some theatres of war for the divisional train to bring up large reserve supplies of lances, but again, in very many other situations, and certainly on our Indian frontier, this would be impossible, and each regiment would have to depend on such arms only as they were able to carry for themselves.

It would seem to be imperative, therefore, for every man to carry a lance in lancer regiments. How, then, should we meet the requirements of the recognized proposition that the lance is the best weapon for the shock and the sword for the *mêlée*?

The first solution that suggests itself is that the rear-rank men should sling lances on their left arms and use the sword. This is but a make-shift

at best, and has the disadvantage that the horseman is hampered in the management of his horse by the lance hanging on his bridle arm; moreover, if in the *mêlée* a lance, thus slung, comes out of the bucket, the rider will be very heavily handicapped, as his horse is liable to become quite unmanageable on account of the lance getting mixed up in his hind legs.

The next solution is that while on the line of march each man carries a lance, on turning out for parade the rear-rank men leave their lances in camp and parade with swords.

In this case, after each engagement the loss of lances before alluded to would tend to swell the rear rank of swordsmen and deplete the front rank of lancers. A proposal has been put forward of late to have a jointed lance made in three pieces which the rear ranks could carry strapped across their backs. This scheme certainly merits a careful examination, as if a strong joint quickly adjustable were devised the idea has great possibilities of usefulness, and the lance thus strapped across the shoulders, as the carbine is sometimes worn, would prove a shield against sword-cuts, whilst inconveniencing the rider as little as might be. Until such a lance has been approved of, perhaps the simplest plan would be for every lancer on service to carry his lance as above on the march, but, on mustering for parade, the rear rank to leave their lances in camp, with the exception of four men per field troop, who should carry the lance on their left arms. This would allow a reserve of 16 lances per squadron to replace casualties.

If this suggestion be adopted, the front and rear ranks should be equalized, and not as at present; moreover, it is essential that some regulation for the manœuvre of the rear rank during the charge should be promulgated. The least distance between front and rear ranks should not be less than eight horses' lengths, and this might with advantage be increased to 25 or 30 yards.

Finally, if we would utilize fully the principle of lance and sword combined, each supplementing and correcting the faults of the other, as recommended by Napoleon, we must teach our troops the proper use of these weapons.

The mere putting men through the lance and sword exercises until they can perform them without a mistake, is not sufficient. European troopers armed with a cut-and-thrust sword must be taught to fence, and native horsemen armed with their national *tulwâr* must be taught to cut. No sword exercise will teach this; nothing but actual practice in cutting with a true edge on foot and on horseback. The drawing cut requires practice, which alone insures perfection. No exercise except actual cutting will suffice to teach the use of the sword. If sheep and other animals are too expensive, a very good substitute will be found in a bundle of sugar-cane which may be procured in most localities in India.

So far we have considered the best armament for divisional cavalry, whose objective will be, in all probability, the enemy's infantry. We have also seen that, taking the consensus of opinion of recognized authorities on the subject, lancer regiments should carry, every man, a lance, but that when parading on service, the rear ranks, with the exceptions noted, should leave their lances in camp or with their baggage guard in rear. It now re-

mains to be considered how best to distribute in the independent cavalry division the regiments armed with swords. Taking, as a general principle, that lancer regiments and those armed with the sword, be they dragoons or hussars, should be of equal strength, we should have in a division of nine regiments—*i. e.*, three brigades of three regiments each—either five regiments of lancers and four of swordsmen, or five of swordsmen and four of lancers.

In the first case, let us see how the lances and swords ought to be distributed. The lance has been proved to be the weapon best suited for the shock of attack: therefore, beyond doubt, our first or attacking line should be lancers. Assuming for the purposes of the present consideration that a brigade of three regiments is a suitable force for the attacking line, we have, in the first line, three regiments of lancers. The second line, or supports, may be disposed either on one flank (the exposed flank, if there is one) or on both flanks; and as this is also an attacking line, intended to deal with the second line of the enemy, these regiments should also be lancers (two regiments). There remain the reserve and the "surprise squadrons." * These squadrons have not to attack in the first instance, but to fall on the rear of the enemy after the shock; they should therefore be swordsmen, and not lancers. If we distribute three squadrons to the first line, or attacking brigade, and one to the supports, (Plate 1, Fig. 1) we shall have remaining three regiments armed with the sword for the reserve. That the reserve should be composed of swordsmen is indicated by considerations on the proper use of the reserve, for which there is no place in this paper. In my opinion the reserve is a body of troops at the disposal of the general officer commanding, from which successive units—be they squadrons, wings, or regiments—are to be thrown into the fight as it develops. It follows that their services will not be called upon until the *mêlée* stage is reached, when, as we have seen, the sword is the better weapon.

Should one division, however, be outnumbered, and should five regiments in the first line and supports not be equal to cope with the enemy's array, then a whole regiment, or even more, may have to be detached from the reserve previous to the *mêlée* stage, but these should be kept well back in echelon on the exposed flank, and not pushed up into the fighting line.

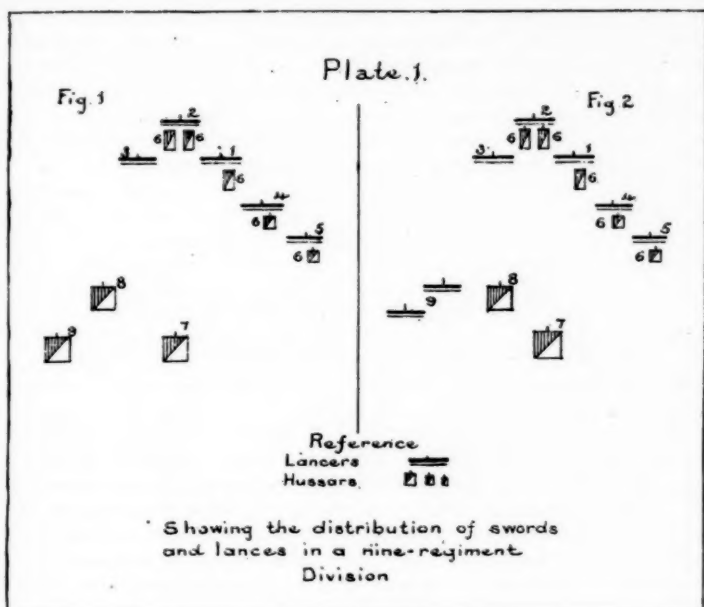
In the second case of four regiments of lancers and five of swordsmen, the attacking line would still be composed of three regiments of lancers, the supports of one regiment of either arm, and the reserve as before. (Plate 1, Fig. 2.)

Where the division is composed of six regiments—*i. e.*, three brigades of two regiments each (Plate 2)—the attacking line would still seem to be best constituted if the three lancer regiments be placed therein.

The remainder would be armed with the sword and would most probably be disposed—two regiments as supports, and one in reserve.†

* These squadrons will in future replace the useless "succor squadrons." Their mission is to fall on the enemy's rear immediately after the shock, each field troop acting independently under its own leader.

† In the case of so small a division acting alone, the surprise squadrons must be dispensed with.



That this distribution of the cavalry division into three lines is not by any means obligatory, must be clearly understood. There are no fixed rules that arbitrarily govern the employment of cavalry against their own arm. There is no reason, under certain circumstances, why the whole division should not attack in a single or double echelon of regiments, or even wings—the general principle being observed of putting the lances forward in the fight and keeping the swords, as far as may be, for the *mêlée*.

MODERN COAST DEFENSE TACTICS.

BY CAPTAIN J. STANLEY, VICTORIAN PERMANENT ARTILLERY.

(From the *Journal of the United Service Institution of Victoria*.)

GENERAL PRINCIPLES.

IN dealing with the question of Coast Defense, the drill-book plainly states that it only purports to lay down such general principles for artillery organization and fire control as may serve as a guide for the preparation locally of a detailed scheme for the artillery defense. Such local scheme for each individual work would be the outcome of many carefully thought out experiments, conducted by competent and highly-trained artillery officers, armed with a complete knowledge of local conditions.

This plan, when finally adopted, would be duly and frequently rehearsed, with a view to its possible improvement or correction, and also to familiarize all concerned with its details.

The scheme of defense for each special unit having been formulated, and all details connected therewith entered in the permanent record of the work concerned, the artillery commander would devise a scheme for the complete unification of his command, so that the chain of fortresses or guns would work together harmoniously, to each other's mutual assistance, protection and support.

The attendant difficulties connected with the preparation of a plan for the organization of an extensive "fire command" are manifold, and, to some degree, perplexing. Many conditions—some conflicting—require to be fulfilled and reconciled. The situation demands a master mind to arrange the details and to make provision for all the possible contingencies attached to so great a responsibility.

On this point the drill-book sounds an emphatic note of warning. It says: "It cannot, however, be too strongly urged that even the best organization, unless constantly practised, will not only fail of its object in time of war, but be worse than useless, as limiting to an injurious extent the responsibility and initiative of subordinate officers."

It would almost appear from the foregoing that an improperly-prepared or unfinished plan would be preferable to the highest form of organization if incompletely rehearsed. This is not, however, what is meant (as I take

it). What the drill-book aims to demonstrate is the imperative necessity for the establishment and maintenance of a high standard of wholesale efficiency, such as can only be attained by continuous practice and rehearsal. Efficiency so absolute and complete should enable every one concerned to act coolly and promptly in any emergency, and without the possibility of any blunder from ignorance or surprise.

It is only within the last seven years or so that the tactics of coast defense have assumed any definite shape. Previously it would appear that coastal fortresses were supposed to be fought on somewhat easy-going lines, and the garrison artillery service was held in comparatively poor regard. Now the general principles which govern coast defense tactics are plainly laid down, clearly taught, and intelligently practised, and the G. A. is an arm from which, at present, much is expected.

The vast progress which has been made in coast artillery work during the past few years has been chiefly due to the introduction into the G. A. services of electricity, hydraulics, steam, and, perhaps, most of all to the application of highly perfected scientific instruments. These forces and powers have gradually revolutionized the coast gunner's work.

Colonel Jocelyn, R. A., in his lecture on "Coast Artillery in Action," says: "From the introduction of electric communication dates the *renaissance* of the G. A."

Steam and hydraulics interest us very little as gunners here, but with regard to electricity in its application to communication, and as a means of firing guns, I propose later on to refer to a few of the points with which I dealt in my lecture on "Position firing," delivered to the artillery section of this institution recently.

CHAIN OF COMMAND.

I would now direct your attention to the newly laid down "chain of command," as set forth in Army Order No. 2 of 1896.

The general chain of command in a fortress and its connection with the artillery chain of command:

1. Every fortress will be under the command of a "fortress commander," and be divided into "sections," each under a "section commander," who will be responsible generally for his section of defense.

2 (I.) Each section command will include the portion of the garrison allotted for its defense, and the fire commands within its area.

(II.) The boundaries of section commands will be so traced as to include entire fire commands. A fire command must never be partly in one section and partly in another, except to the extent provided for in (3).

(III.) All personnel and matériel will follow the guns, *i. e.*, officers, men, and instruments will belong to the fire command in which their guns are situated, even when their stations are topographically in another section or fire command.

3. The general chain of command and the communications will invariably run from the "fortress commander" through "section commanders" to "fire commanders," with which latter officers the chain of artillery command will commence.

4. The fire command will be the highest unit of executive artillery command.

The fire commander will be under the immediate orders of and be in communication with the "section commander."

The chain of artillery command will invariably run from the "fire commander," through the "battery commanders," to the "gun-group commanders."

5. The general or other officer commanding the Royal Artillery will be employed on the staff of the "fortress commander." In some few cases the paucity of officers may render it necessary for the officer commanding to act as a "section" or "fire" commander; but such cases must be exceptional, and exceptionally treated.

ORGANIZATION BY FIRE COMMANDER.

The foregoing order clearly prescribes that the fire commander will be the highest unit of executive artillery command. Let us glance briefly at the primary duties and responsibilities of this officer—the fire commander. It is laid down that the sizes of a fire command will be governed by the character of the water area to be defended, and by the number of the forts and batteries which it may be possible for an officer to direct in action. Local conditions must, therefore, clearly define the limits of a fire command. One fire commander might be weighted down with the obligations attendant upon the control of a chain of important forts, whilst another would find his responsibilities limited to the command of a single work. In either case, whether great or small, the onus of responsibility of the organization and preparation would be on the shoulders of this officer.

One of the F. C.'s first considerations would be the selection of his fighting station. This should be in such a position as to insure him the most extensive possible view over the fire area and the sea area beyond it. With a line of defenses of considerable depth, but with narrow fronts, his position would, as a rule, be a well-advanced one, but with defenses having an extended frontage his position would probably be a central one.

Armored protection would be costly, and at the best ineffective against heavy projectiles and high explosives.

Fighting stations then would have to depend on their small size and on concealment. They should therefore be made to assimilate as much as possible to the surrounding country. The exact manner in which they should be disguised is obviously a matter for local decision.

The next consideration would be the efficient training of the specialists. These would include D. R. F. and P. F. specialists, specialists for electrical communication, artificers, master gunner's staff, etc. A careful selection would require to be made in the first instance, and the men chosen then properly instructed in regard to their respective duties.

Attention would now be devoted to the distribution of the fighting force available under the B. C. to the different classes of ordnance in the fortresses. In order to make clear the F. C.'s organization work, a few definitions may be of use.

A "coast fortress" is defined as an area of land and sea, provided at

certain points with an artillery armament, partly "fixed," partly "movable," and its area is the extent of land and water which can be covered by the fire of its guns; the water area is the part with which we are concerned.

The fixed "armament" consists of such guns as are mounted on garrison mountings in permanent positions of whatever nature. It is divided into two classes, the "primary" and the "secondary" armament.

The "primary armament" consists of R. M. L. guns of 7 inches and upwards, and of B. L. guns of 6 inches and upwards.

These guns fire armor-piercing projectiles, and would be used to attack the armored portions of vessels as well as the unprotected parts. The "secondary armament" consists of the lighter natures of R. M. L. and B. L. guns, and quick-firing guns on garrison mountings, whose function would be to keep up a rapid shell fire on the unarmored portions or the ports of an enemy's vessels, and to repel boat attacks or attempts to land troops, and in some cases to assist in the protection of mine-fields. The "movable armament" consists of siege guns and howitzers, field, machine and quick-firing guns, on travelling carriages. They would be employed sometimes in prepared emplacements inside the forts to intensify the shell fire of the secondary armament, and generally to assist in the various tasks mentioned above; more usually they would be placed outside the fort in selected positions.

With regard to the matter of "primary" and "secondary" armament, there is little to discuss within the scope of this lecture. Our guns and mountings, though many of them are of premature birth—that is, of dates anterior to the Mark I. Service ordnance—are good and serviceable in most respects.

Defects of design and many minor manufacturing defects, such as are inseparable from untried departures in gun and mounting making, have been discovered.

Some have been rectified locally, under our own I. O. M., and weaknesses of a more serious nature have been and are being remedied in England. The existing armament at P. P. Heads, however, seems sufficient for all present possible requirements, and it will, I presume, be augmented as guns under alteration are completed.

With reference to the "secondary" armament, I should like to see a few Q.-F. guns, mounted on light transporting carriages, which would enable them to be rapidly conveyed from one flank of a fort to another where their presence would be more useful. Spare field-guns would doubtless be utilized as part of the "secondary" armament in time of war. Siege guns and howitzers for high-angle fire would be a very useful addition to the secondary armaments of some of our forts.

For the good order and serviceableness of the armament the F. C. is responsible, as also for the ammunition supply and its details, and the means of supplying proper accommodation, water, food, and fuel for the garrison.

It would be his duty to satisfy himself that the battery commanders understand the working of their own forts, and the mode of fighting them under his control, under all probable conditions, and that suitable plans have been made and recorded for defense against every form of attack.

Some general ideas would be formed regarding the most probable direction an assault upon any particular work or chain of works would assume. The question—purely a local one—would govern the relative importance of the different classes of ordnance in a fortress, and consequently influence the disposition of the personnel.

Each separate work might probably require special consideration in this respect, having regard to the particular function it would be required to fulfill in connection with the general scheme. Take, for example, a possible form of attack, which I think would not be an entirely improbable one here in the event of Great Britain having lost temporary or partial command of the sea in these waters. A bombardment from a few swift armored ships, commencing at long ranges, having for its object the silencing of the forts or diverting the attention of the defenses, to enable fast cruisers or small vessels to run past, with a view of destroying shipping or rendering useless the mine-fields. In this case the F. C. would require to determine, with reference to every link in the chain of his command, the importance of his heavy, medium, and lighter B. L. and R. M. L. guns, his Q.-F. ordnance, and secondary armaments at the various stages of an engagement, and make his preparations and dispositions beforehand—no light task.

To obtain the best possible results, however, the main principle to be observed is that the most intense fire should be directed, at every phase of an engagement, at that part of the attacking force whose action, if successful, would most imperil the defense. It is a generally accepted axiom that guns alone cannot be depended upon to stop ships "running past."

From this standpoint I may say, parenthetically, that the South Channel line of defenses, for instance, would provide ample food for thought for the artillery and engineer commanders in the preparation of plans, allotments of work, and distribution of personnel for attack and defense. In this section of our defenses Q.-F. guns would, of necessity, play a most important part, if, indeed, the armament should not consist of Q.-F. ordnance only.

Q.-F. GUNS.

As having a distinct and most important bearing upon the F. C.'s duties of organization, I feel compelled to dwell shortly upon the requirements of the most essential portion of fortress armament. The term "quick-firing" as applied to guns firing black powder is a dangerous misnomer. The rate of fire depends not only on the mere rapidity of loading, but upon the rapidity of laying, and the presence of smoke may interfere so much with the latter that the rate of fire may be reduced to that obtainable from a gun of ordinary type, or even below it, and the chief value of the Q.-F. guns may be lost.

Smoke also militates against the employment of the Q.-F. guns in groups. The imperial navy are receiving nothing but smokeless ammunition, and it is now issued, I believe, to the L. S. at home. In any case the "cordite" is in store, and can be quickly supplied in war time. In my opinion, it would be an enormous advantage, from many stand-points, if a Q.-F. section of specially selected, smart, intelligent, N. C. O.'s and gunners were

formed in each G. A. Militia Battery. It would afford a welcome relief from the ordinary heavy work of the garrison artillery, and should tend to generally smarten the batteries. It would act as an encouragement for the ambitious layers and gunners to qualify for this *corps d'élite*.

Even if in the F. C.'s scheme of defense the Q.-F. guns should be allotted to the permanent artillery, it must be remembered that at least two reliefs would be required to fight the guns, and "understudies" are necessary in every line of life's work.

One of the most essential requirements of Q.-F. guns is that the trajectory should be flat, for in using this class of ordnance at critical moments, and especially at night, to correctly give the constant and rapid alterations of range to the tangent scale, the flatter the trajectory the more chance is there of hitting an object even though the tangent scale may not be set to the exact range. It must be remembered that our 4.7 guns have only a muzzle velocity of 1786 f.s., whilst the later Armstrongs, even up to 1893, had an initial velocity of 2500 f.s., and the six-inch Q.-F. of the same date had an initial velocity of 3711 f.s.

Having dealt with the prominent features of the organization of a fire command, I will assume that the commander has perfected his plans, and proceed to the next stage, viz., the writing-up of that valuable volume the "Fort Record Book."

By running through the headings of the archives of a fort, some idea may be formed of the thoroughness with which all data connected with the work has to be compiled, in order that no contingency may occur with which a new commander might not be enabled to grapple more or less successfully, by means of the information furnished by his predecessor, and supplemented by that which he has himself acquired.

My special reason in directing your attention to these records, is that if you will allow your imagination to dwell for a moment upon the details required, you can not only readily conjure to yourselves a picture of what an ideal fortress would be like, but you would also realize what manner of work every coastal fortress in the Queen's dominions should be at this moment.

The "Fort Record Book," then, should contain detailed information in regard to the following points:

FORT RECORD BOOK.

It is of the utmost importance that in every fort a permanent record should be kept of all details of the fort, its general object, history, and armament, as well as all details connected with its organization both in peace and war, which should be in accordance with the provisions of the defense scheme.

It is the duty of the officer in charge of forts to keep up all details of the above nature in the Fort Record Book, Army Book 127, so complete that an officer on taking charge will find all information he can require ready to hand, and in the fullest detail. It must be clearly indexed, kept as confidential, and produced at the general officer's inspection. The book should contain copies of the plan of the fort, and the fort and group charts.

It must also contain details of all the information referred to in the

"Manual for Garrison Artillery," Vol. I., so far as his fort is concerned, so that if tables are lost, or figures in the gun emplacements or range-finding stations are erased, they can be immediately restored, also details on the following points:

Information under the following headings to be recorded:

1. General description and object of the work and its relation to other works in the same scheme of defense.
2. Details of construction, such as thickness of cover or walls of magazines and ammunition stores, material and thickness of shields, nature of parapets.
3. A concise account of all the changes that may occur in the construction or armament of the work.
4. Height and set of tide.
5. Depth of channels.
6. Landing places.
7. Facilities for landing men or stores. Local features generally.
8. Barrack accommodation, camping grounds—for garrison on mobilization—plan of the camp showing distribution of men.
9. Water supply—Orders *re* use of, for cooking, etc.
10. Emplacements.
11. Positions for electric lights.
12. Position for Q.-F. and machine guns or armament for general defense on land or sea front.
13. Detail of the ordnance in the fort.
14. How mounted.
15. How grouped.
16. Range- and position-finding arrangements.
17. Communication.—Full information as to communication, illustrated by drawings, both as connecting the battery commander with the fire commander and with his own subordinate officers and electric lights, and also as to the nature, extent, and purpose of all telegraphic or other communications.
Provision for alternative means of communication where a breakdown may take place.
18. Fighting the fort.—A detailed account of the manner of fighting the fort under various conditions of attack (land or sea front).
19. Ammunition.—Actual contents and capacity of cartridge and shell stores and magazine and ammunition stores to be referred to on the plan. Establishment of ammunition for all guns and S. A. A.
20. Mine-fields.—Position and nature of mine-fields, with elevation and training of guns that can sweep them.
21. Transport and labor—Nature of, and where it can be procured on requisition.
22. Mobilization—Orders for.
23. Hospital accommodation, including the temporary treatment and removal of wounded.
24. Transport and labor available.
25. Preparations for defense.

Names of corps destined to form the garrison of the fort on mobilization, the approximate number of officers and men to be expected, and a general statement of their distribution and duties.

Reliefs and reserves of men and matériel, also a statement of the preparations to be made when war is imminent. These would include the construction of additional traverses, shelters, and blindages, the formation of ammunition depots, if not already done, construction of wire entanglements, strengthening of parapets, and generally the performance of such work as shall tend to increase the strength of the fort, and to render its capture by assault or surprise more difficult.

26. Numbers and general disposition of the field force coöperating in the defense.

27. Prominent objects.—The range and training of the various guns and groups to prominent objects, and, in the case of a narrow channel, to the mid-channel line on various trainings.

28. Tables, charts and plans—copies of the following:—Range tables, full and reduced charges; difference tables, from the various command posts; battery commander's charts; gun group commander's charts; correction tables for range; correction tables for deflection; quadrant table and permissible errors for full and reduced charges; arcs of fire of all guns; Admiralty chart of entrance to Port Philip; heights of guns from axis to mean tide level. Copy of all information regarding D. R. F. pedestals. Copy of the plan of the fort. Copy of manning table, the number for each post to be shown. Plan showing the position of the guns, ammunition stores, magazines, lifts, hatches, G. A. stores, range-finding stations; also how the guns are grouped, and what ammunition lifts supply them with ammunition, places of parade for manning details. The plan should be made out on as large a scale as convenient, the guns and ammunition stores being shown on the plan by their letter or number.

29. Fire orders.

30. Tide signals.

31. Posts and duties of district gunners.

32. Specialists.—Names, posts, and duties. The above includes P. F. and D. R. F operators, telephonists, signallers, and electric light operators.

33. Codes, fire messages, trumpet and bugle sounds, signals.

34. Examination anchorages. Floating defenses.

A part of the book will be devoted as a journal, in which will be recorded, as they occur, all transactions permanently affecting each work or likely to be historically or technically of use or interest to future commanding officers. This book will be kept carefully up to date by the officer in charge himself, be under lock and key in a box permanently fixed in such a building or part of the fort as he may consider the safest and most suitable. It will be open to the use of the officers of the V. P. E. in charge of the district in which the fort is situated.

Officers in charge will make themselves master of the contents of this book, and will be responsible for its safe custody, and they should point out to the commanding officer, for reference to higher authority, any points

that cannot be carried out, or that are capable of improvement, but they must not alter it without permission.

(Note from G. A. Drill Book, 1895, not circulated at date of lecture.)

ATTACK AND PENETRATION OF ARMOR.

The attack and penetration of armor is such a wide subject, and the service rules and directions are so complete that I will only attempt to set forth a few general principles which should serve as a guide.

I cannot do better than quote briefly Major Hansard, R. A., on this subject.

FIRE TACTICS.—ROUGH RULES AS A GUIDE FOR FIRE COMMANDERS IN THE ATTACK OF SHIPS.

1. Fire should be opened at as long a range as possible with common shell and percussion fuse, unless the armored deck is well within the power of the gun at that range.
2. When the range has decreased to the point at which penetration of the armored deck may be reasonably expected, use armor-piercing projectiles until further decrease of the range causes the angle of descent to fall below 10 degrees. If no penetration can be expected, use percussion common at the deck till this angle of descent is reached.
3. When the armored deck can no longer be attacked (by direct fire), use percussion common at the unarmored portions of the vessel. A part of the secondary armament, or one or two groups of heavy guns where there is no secondary armament, should employ percussion shrapnel at the upper deck and at the secondary battery (percussion or plugged).
4. When the range is further decreased to the point at which the guns are certainly more than a match for the vertical armor of the ship (taking into account the inclination of her course to the line of fire), and at which (taking into account the size of the armored target) there is reasonable hope of hitting it, use armor-piercing projectiles at that armor, for preference choosing the belt to fire at.
5. The attack of the unarmored parts of the vessel by percussion common and plugged shrapnel should be continued simultaneously with the attack of the armor, the latter task being allotted to a portion only of the heavy armament. Common may be used plugged when the range is such that there is little likelihood of missing the side of a ship.
6. Quick-firing and machine- and field-guns should be employed to keep down the fire of the auxiliary armament in the tops and on the upper deck; and at close ranges to fire at the ports, and, where the height of site admits, into the barbettes.
7. At close ranges, time shrapnel should be used to clear the decks and prevent the working of guns in barbettes and stationary vessels.
8. Against cruisers having completely armored hulls, or other lightly armored vessels, attack as above, except that, when the range is such that penetration of the armor by common shell may be expected, use that projectile, plugged, against the armor.

The same general rules govern the choice of projectiles for high-angle fire as for direct-fire guns. A given number of shots penetrating soft armor

will probably do an equal amount of damage, whether they strike successively or simultaneously.

The damage done to a ship protected by hard armor by a given number of shots will probably be much greater if they strike the armor simultaneously than if they strike in succession. The simultaneous explosion of several heavy shell between decks may be expected to produce more disastrous effects than would be caused by the same number exploding singly. The "racking" effect on the ship generally will certainly be greater if the projectiles strike at the same instant.

For these reasons guns are, in almost all cases, fired by salvoes, the only exceptions being when ships are lying off at long range, and when, at the commencement of the action, a few trial shots are fired to obtain the necessary corrections. The groups may either fire independently, independent group salvo fire, or in succession. The former gives the greatest volume of fire in a given time, and slowness of loading by one group will not delay the others; as a general rule, it would be used when laying by quadrant elevation and training arc, while battery group fire, commencing with the leeward group, would be resorted to when using sights, to avoid interruption of the laying of one group by the smoke of another. As regards the rate of fire, this would naturally be slow and deliberate at the longest ranges, increasing in rapidity as the range decreases, and the projectiles have more effect; while against ships forcing a passage past forts, the fire as they approach the part of the channel where they will be at shortest range, should be as rapid as possible consistent with accuracy.

FIRE CONTROL.

To enable our shots to hit the target there are three methods in use.

1. With no instrument to find the range of bracketing.
2. D. R. F.
3. P. F.

With the two first all gunners are familiar. The position-finding system being now generally adopted in all important fortifications in the empire, deserves a few words of description, which should not be out of place. The position-finder is merely an instrument for finding the position of an object. Position finding is a system by which guns can be effectively laid and fired without the men at the guns viewing the object fired at. It consists of many other appliances besides the P. F. proper. A position-finding system consists of:

- (a) An instrument by which the range and bearing of an object is automatically obtained.
- (b) The means by which the ranges obtained at a distant observing station are turned automatically into ranges for the gun.
- (c) The means by which, not only are the ranges from the gun obtained, but also the true bearing of the object from the gun is found.
- (d) The means by which the position of a vessel some time in advance is predicted.
- (e) The means by which these true ranges and trainings are communicated instantaneously and automatically at the guns.

(*f*) The means by which this information is utilized at the guns, or, in other words, the method of laying the guns.

(*g*) The method of firing the gun or guns.

(*h*) The arrangement of the guns into groups.

Now, before going further, it will be as well to define the difference between a range- and a position-finder.

A range-finder is an instrument which only gives the distance from itself to the object sighted.

A position-finder is one that marks on a plan the exact position of the object, and is thus capable of giving the range from any other point marked on the plan.

(*a*) Method of obtaining the range. There are two systems by which the range has been determined for position-finding purposes.

(1) One utilizing the height of the observer above the sea level (vertical base).

(2) Using a measured horizontal base, from the ends of which cross bearings can be obtained.

The first is the simplest, inasmuch as it only requires one observer, but it has the disadvantage of being very small compared with the distances to be observed, and therefore requiring great precision in the instruments. Recent trials have, however, shown that fair accuracy can be obtained at such heights as 23 feet.

All gunners are acquainted with the service depression range-finder, designed about 16 years ago. Without entering into details, I may point out that the range is obtained by simply directing the cross wires of the telescope on to the object by means of the drum; the graduations give the range in yards, the slider having previously been put to the height of the battery—the mathematical principle being the familiar one of observing.

The angle (*a*) due to the range *R* from height *h*.

The distance of an object on the sea-level can always be ascertained, from an elevated battery, by means of the angle of depression or the angle subtended by the object and the real horizon.

In the position-finder the range is obtained in a different manner.

Let *a*, *b*, represent the height of the battery, *b*, *c*, the range. (I am aware that this is not the theoretical range, but it is sufficiently good for all practical ranges.) Now, if we draw *a d* parallel to *b c*, the level of the water, and set up *d e*, some proportion of *a b* (that is, representing *a b* on some definite scale), it is evident from the principle of similar triangles that *d a* will represent, on the scale, the range *b c*.

This is what is done in the instrument. The axis is set up to represent the height of the instrument above the sea; slide the upright till the cross wires of the telescope cut the water line of the object representing the line *e c*. The distance, then, of this upright from the axis represents *d a*, the range. This is engraved on the bar, and can be read off at any time.

(2) HORIZONTAL SYSTEM.

The mathematical principle on which this is based is that of similar triangles.

When following a moving object, of course, these similar triangles must be constantly remade.

The mechanical principle of the position-finding system may be described as that of plotting the position of the target by the horizontal and vertical motions of a depression range-firing telescope. This telescope is attached to a metal arm pivoted over the point on the chart representing the actual position of the observing station. At the point on the chart representing the position of the gun another arm is pivoted, connected with the first (or telescope arm) by a movable collar. By suitable gearing on the gun arm, the movable collar is made to advance and recede, and the arm to move radially. By these means the telescope attached to the other arm may be directed on any object on the water, the position of which will be indicated, as before described, by a point on the collar immediately below the intersection of the arms. The same gear which governs the movement of the collar, records electrically the amount of its motion and that of the gun arm on two dials. These dials, which are placed near the gun, are graduated to show the range of the object in yards, and the bearing or requisite training of the gun.

For a moving object, Colonel Watkin employs what he terms the "predicted firing" system. The movable collar referred to above carries a pencil, which traces on the chart the movements of any object, say a vessel, on which the telescope may be directed. As both the direction and speed of the vessel are thus indicated, its position at a convenient distance ahead may be readily predicted, and the telescope directed on it. The corresponding reading on the dials at once enables the guns to be laid on this point, and when the object indicates its arrival thereat by coming into the centre of the telescopic field, the guns are fired electrically by the observer. Should the vessel change her course, and thus throw out the prediction, the process must be repeated.

Whatever point of the water the telescope is aimed at, the dials will indicate at the gun the range and training to hit the object at that point.

Now, if instead of laying the telescope on the object, we drive it forward to some point in the extension of the track, we give the detachment time to lay the gun by the indications on the dials before the vessel has arrived at the predicted point. The amount of prediction given can be varied to suit the varying skill of the detachments. For direct fire half-a-minute prediction should be sufficient. But, as the predicting scale is marked, the distances travelled over for $\frac{1}{2}$, $\frac{3}{4}$, and 1 minute, showing the length, the track must be extended for those times.

(g) Method of firing the gun.—In the old system, with squares, the gun was fired as the dials indicated that the vessel had entered the square. In the new system, having got our gun laid on the predicted point, we want to fire it the moment the vessel arrives at that point, *i.e.*, when she crosses the centre of the field of view of the telescope marked by the cross wires. For this purpose a low tension electric tube is employed. This, roughly speaking, consists of an iridio-platinum wire embedded in gun-cotton and powder. A current from the battery being sent through the wire heats it, ignites the gun-cotton, and fires the tube. Those acquainted with electri-

city will know that if the observing station and gun are some distance apart a powerful battery would be necessary to supply sufficient current to fire the tube. To get over this the observer, when he wishes to fire the gun, presses a button, which attracts a magnet of what is called a relay, and by this means closes the circuit of a local battery through the tube. To avoid any possible accidents, the firing arrangements have been designed—

(a) So that the individual gun cannot be fired until its own gun captain has given the permission by inserting a plug.

(b) None of the guns of a group can be fired until the officer in charge of that group has given permission by moving a switch handle to the word fire. Until these operations have been performed the observer at the distant station cannot possibly fire the guns.

COMPARING D. R. F. WITH POSITION-FINDER.

With D. R. F. we have—

1st. To find the range.

2d. To transmit this range to the gun, and then to communicate to the officer in charge to what targets this distance refers.

3d. Corrections for displacements have next to be made.

4th. The gun has now to be laid.

The transmission of ranges from D. R. F. to gun groups is a difficulty not very satisfactorily overcome. I entertain grave doubts as to the practicability of working with the dial indicator range in large fortresses where guns are distributed over wide areas in time of war. It is now generally conceded that the D. R. F. must be placed at as safe a distance from the group as possible, although they must be necessarily greatly exposed. The number of men required to work dials in a fort, say, like Nepean, would be a serious drain on the garrison. Then there is the great difficulty of ascertaining to which target a range refers. This would be largely accentuated in time of war with several vessels attacking. Of course electric dials working with D. R. F. would to a great extent modify these disadvantages.

Now the position-finder gives at once the actual range and bearing to enable the gun to hit the ship, and this range and bearing is recorded automatically and instantaneously in the emplacement. No corrections of any description require to be made. Laying is quicker generally. Then, even if dials and electric communications all go wrong, the P. F. is as good, in fact a better range-finder than the D. R. F. The P. F. has also the advantage of requiring fewer men to work the system. A P. F. once set up does not require adjusting. D. R. F. requires to be levelled every time it is used. With P. F. there is no difficulty about identifying the required target. The observing instrument being larger, better readings can be obtained. For night firing the P. F. would have a great advantage over the smaller and less accurate instruments, especially with regard to lighting arrangements.

To sum up, the P. F. gives the best form of fire direction and the best natures of fire control. Steady fire can be maintained, independent of smoke, from a safe position, apart from the noise and confusion of action. The

firing arrangements are instantaneous and safe. No gun can be fired without the full knowledge and the concurrence of three persons, viz., the fire commander, the gun group commander, and the gun captain.

IDENTIFICATION.

The F. C. should have in his possession tables and identification sheets of the navies of the world, and he should make himself familiar with every particular concerning every vessel within ordinary striking distance of his station. If the F. C. himself has no special knowledge of ships, an officer who possesses and has cultivated the gift of distinguishing vessels should be detailed to assist him. On the identification sheets the ships are arranged with a view to narrowing the work as much as possible to a comparison between types that resemble each other. Notwithstanding that every effort has been made to render the work of identification as easy and simple as possible, careful study, extending over some time, is absolutely necessary to enable an officer to master the details of the sheets so as to be capable of differentiating rapidly and correctly between vessels having many points of resemblance, but of varying types, each probably requiring special forms of attack.

It cannot be again too strongly impressed upon artillery officers that upon themselves will devolve the entire work of identification. No help can possibly be expected from the navy. Careful and continuous training for the performance of this all-important work is, I believe, an imperative necessity.

Lord Brassey's Annual will be found useful reading to G. A. officers in connection with identification sheets.

CONCLUSION.

A well ordered and properly constructed fortress, armed with modern ordnance of various calibres, good ammunition, communications and instruments up to date, officered and manned by smart gunners, is now a proud command.

An eminent authority says:—"The office of permanent fortifications is to avert attack. Coast fortress should be able to defend itself against any form of assault, and to protect everything within its defenses."

The efficiency of the garrison gunner is his insurances.

DISCUSSION.

Lieut.-Colonel HALL.—I suppose we are all very glad that we have reached a point at which we can listen to a lecture on the tactics of coast-defenses by artillery. It has been an old experience of mine this want of information as to how to organize the forces put under one's command in fortress work, and it has been a pressing want in our branch of the service for many years past. I suppose it is about thirteen or fourteen years ago since it first fell to my lot to exercise a fortress command, and when I began to attempt the job—I had, of course, gone through the ordinary routine work of drilling with guns, and so on—all at once, the first thing that dawned

upon me was that I did not know what to do with my forces when I had got them. At that time I was smitten with a zeal to know, and with that zeal for knowledge I endeavored to get some information, but could not obtain very much. In my blind ignorance I set to work, and evolved what I thought would be the tactics of fighting my particular fortress under the conditions as they were. I committed this to writing. Now, I am sure that, judging by the standard that we have to-day, the attempt was a very crude one, and a comparison with such work as set out to-night will enable us to realize something of the advance that has been made.

In those days we had muzzle-loading guns, a very slow fire, and our range-finding instruments were *non est*. I remember our gunners were very excellent gunners indeed, but our theory was something the same as that in Donnybrook—"Whenever you see a head, hit it." If you saw an enemy you fired away at him, and put as many shots into him as you could. Now we have range-finding instruments, control of fire, and communications better organized, and so on, but when you compare things as they are to-day, as we know them, with the ideal represented by the up-to-date tactics of fortresses in other parts of the empire, I can only say that we realize that we, in this colony, are almost as far behind what we ought to be as we are in advance of what we were thirteen or fourteen years ago. Though attending to a good many of the lower portions of our work, we are, to a large extent, neglecting those higher functions, which come under the heads of Fire Discipline, Control, Communications, and Identification. Therefore, I place great practical value on this lecture inasmuch as I look upon it as an eye-opener, which will force us to reach forward to a better state of things. In the lectures we have had we have been assuming that we have here a tolerably up-to-date armament. Now, we can very readily realize that we are not up to date in one thing—position finding. I am quite with Captain Stanley on this, for it is a crying want in our fortresses at the present time; and I am inclined to think, at all events I am speaking with reserve and modesty, that we may be making a mistake in adopting a system of tactics derived from home fortresses, where the position-finder is a part of the armament in fighting our fortresses, where a proper position-finder does not at present exist. Is it advisable that we should so strongly centralize our control of fire in the present state of our communications, and in the present condition of our means of finding the position of an enemy? As I understand, the cost of supplying a reasonable number of position-finders to govern the groups in our fortresses around the Heads is not so great that we should hesitate in forcing, as far as we can, upon the government the desirability of supplying them. Then, given a position-finder, and thoroughly centralized control of fire, I think we may almost assume that when the supreme test comes some link in the chain of our defense will be found weak, and, if I may use a colloquialism, "Things may go bung." Now, the English book that is just out, which has been referred to in the lecture, realizes the possibility of that difficulty and provides for it; that is to say that, as your system of defense, your control of fire may fail at one or more points, or something may go wrong; the control will then have to be divided, and be placed in the hands of smaller units, so that finally each gun may pos-

sibly fight "on its own hook." That being so, is it not desirable that we should call for an initiative among our junior officers? At present the idea is, and a very theoretical one it is, that everything is centralized in the hands of one man, but we are making an endeavor to realize the possibility of that one man being knocked on the head early in the engagement, or his control over his guns otherwise failing, and are trying to inculcate among the commanders of smaller units the necessity of at once taking up the control and exercising the initiative. That is, I think, a very necessary thing to practice. I agree with the lecturer, too, as to the necessity of fortresses having a record book. Our changes have been tolerably rapid. A man learns as much as he can of his station, then he may go away to another fort, and whatever he has learned he takes away with him, and it is of no use to his successors. In each case he acquires a certain amount of information of the highest value. But he is under no obligation to systematize and tabulate this, or to leave it on record in any readily available way, and thus a new officer has to lose time and take trouble in going over the same ground. Palpably this should not be. The odds and ends of information which have been catalogued here are of very considerable length and value, and very little consideration will enable you to realize how very useful such a record might be. Now, as far as we know these records do not exist, and it is nearly time that some start should be made in that direction. I have been very much interested in the lecture. I knew that it would be of value to my own branch of the service. In many respects it is an eye-opener, and I hope that one and all of the garrison artillery here to-night will endeavor to push on towards the goal which Captain Stanley has put in front of them, viz.: to make our fortress defense an ideal one.

Major OUTTRIM.—On the question of the identification of ships, what is the law of nations with regard to showing colors? Supposing you have, as you will have, landsmen in charge with no knowledge of shipping, and a man-of-war is approaching showing no colors, is it permissible under the law of nations for an enemy's ship to fly the flags of a nation with which they are at war—to sneak in under false colors? With regard to the record book, that is a want that must obstruct every commanding officer going into the forts with no knowledge except what he can pick up. There is no record with regard to armaments or any other matters that it is important he should know. I agree with Colonel Hall that we are very much indebted to Captain Stanley for his most useful and attractive lecture.

Major TOPE.—I am exceedingly pleased and interested in the lecture this evening, and the information I have gleaned is of great value to me. One thing has always puzzled me: the lecturer gave us an instance of a supposed attack by vessels fighting with a certain formation and in a certain way. I am taking the position of battery commander at Gellibrand. We see certain vessels in the distance, which probably are disguised, and which we presume to be certain cruisers or line of battle ships. We have tables and information (or we are supposed to have them), and we must look up all this information and find out how we are to fight those ships. But in the meantime these ships are coming on, and, by the time we have made up our minds what to do, they may have passed out of sight or blown some

of us away, or rendered us incapable of making any resistance at all. I think General Geary, in a paper before the Royal Institution of Artillery, lays stress on that point, and he worked on the principle of saying—"Here's a ship, let's hit it, no matter with what, as often as possible. She may have a belt of armor or be a protected cruiser; we have certain guns, let's use them to the best advantage." Quick-firing guns would be used to keep down the personnel of an enemy, and I agree with the lecturer with regard to black powder. The quick-firing guns, it has always been understood from the first, must have smokeless powder. That is a thing we are very much behind in here. A fortress record book is a most desirable thing in every way. It takes an officer a considerable time to learn his gun; every gun has its equation, and if that can be turned up in a book, the commanding officer, before he uses his guns, can find the history of certain guns and compare them with other guns. Of course, where we have muzzle-loading guns and breech-loading guns side by side in the same fort, where we have to indicate the ranges of B.L. and M.L., only by the one dial, I think it is absolutely necessary that the group officer should have some information telling him that his gun shoots 50 yards short of the range he will get, or *vice versa*. I speak from my own experience with regard to our B.L. guns, and I find that they shoot short of the M.L. guns. The quick-firing guns, on the other hand, shoot over and beyond.

Lieutenant OAKLEY.—I should like to give my ideas of the commanding officer's work, speaking from a group officer's point of view. At present we are supposed to go as near as possible to the actual conditions of war, but it seems to me that as soon as we would start fighting a great change would take place. There would be some alteration in our system of defense. For instance, it does not appear probable to me that our commanding officers would long occupy the positions they do at present. They are there simply as a target for the vessels coming in. I think when we make our dispositions in peace time, they should be as near what would be our places in war time as possible. For instance, the positions for finding range would be greatly handicapped by being where they are. Take a misty day, when the atmosphere is heavy, and when through the black smoke the guns would be obscured from the instrument finders, then these would have great difficulty in finding the range, and the smoke would deter the group officers from seeing the dial. It is very difficult in peace times to do this, but under war conditions it would be impossible, and I am sure an enemy would not stand very long as a target in one position. It seems to me that when arrangements are made for finding range that this should be taken up in some way when we are at practice, and not left for a time when we find we won't be quite so much at home in all those details which should have been rehearsed at practice. Again, whenever we go into practice it is taken for granted that no damage will be done to anybody. So a group officer has no opportunity for "running his own show," as Colonel Hall put it. He gets an idea of placing reliance on somebody else, and loses the opportunity of gaining information and of getting confidence in himself which he ought to have. We should have no surprises sprung upon us, and all the positions should be taken up and no loop-hole left through remissness

at practice. I am very much indebted to Captain Stanley for his lecture, and only wish we had more of it.

Captain MONASH.—I desire also to render cordial thanks to Captain Stanley. It is always fascinating to listen to details of a well-organized scheme, but I am very much inclined to indorse Colonel Hall's remarks that the attempts to adopt such a complete scheme of defense here must result, as it has done, in very considerable discouragement. Garrison artillerymen will admit that the very fact of having a complete system of coastal defense brought before them in this pithy manner leaves an impression on their minds of discouragement; it makes us feel how powerless we are to live up to the ideal set before us. With the material put into our hands it might be thought by outsiders that a great deal would depend upon ourselves and our own intelligence in improvising details to fill in the deficiencies in our equipment; but that is not so; the deficiencies are so serious that I think we are unduly hampering ourselves in endeavoring to carry out even in outline such a complex conception as that of fighting a complete coastal fortress from one responsible head. It is very much the same as if a field force were sent into the field without signallers, engineers, or ordinary equipment—as merely a band of riflemen without the necessary adjuncts for carrying on field tactics. What would become of the field tactics if you cut out such minor but necessary adjuncts? These adjuncts are, in the case of garrison artillery, not at all minor—they are the principal features in the arrangement of the whole system. It was within my own experience that we passed from the stage of individualism to the stage of collectivism, if I may call it so, by grouping together and concentrating the garrison artillery work. I realized very soon that we were aiming at something we could not effectually carry out with the means at our disposal. But, apart from this local question, it occurs to me to ask the lecturer to express his views on the probability of this very complex system being completely effective or not when put to the test. Has it, in point of fact, ever been put to the real test, and is not the machine too complex a one to work successfully under conditions of a severe trial? There has been a very great deal of valuable information put before us, and when it is published I shall regard it as a very excellent handbook for reference.

Captain STANLEY replied as follows: I am exceedingly gratified with the kind manner with which you have received this, from my stand-point, very incomplete lecture. I had aimed to do great things. I had determined to lay before you to-night a thorough picture of the responsibility of the fire commander from every possible stand-point, from the initiation of his taking the command, following through his organization of his fire control, his fire tactics, and his fire discipline, but the disabilities under which I have labored have been very great, and I have before me to-night a very considerable amount of matter I did not inflict upon you for two reasons; one reason is that in the lectures I gave to the artillery sections of this institution, I felt it very strongly my duty to impress upon you two particular points—the identification of ships especially, and how to attack armor. I wanted to cull from lectures I have delivered on this subject the points to impress upon you; but it occurred to me that several of you had listened

to these lectures before, and if I were to dwell upon these matters again, although sufficiently valuable for reiteration, you might think that I have come to pump up some old lessons which you had heard before. I wanted to bring before you several of the details in connection with the electrical firing of guns and the identification of ships, but having dealt with them before I trust that some of my notes may be published. I have refrained, wisely, I think, from recapitulating them. Colonel Hall mentioned that he would like the smaller units of a fire command to take the initiative; before I come to that I would like to go a step further. I would like to see a much more important thing accomplished, viz., the higher units, the fire commanders themselves, to have a better opportunity of exercising their initiative. I would like to see the fire commanders take their identification sheets—which I am sure are rendered so plain, inasmuch as they are prepared in such a simple and easy form that with ordinary study any man, whether he has a knowledge of ships or not, can master the details—and practice with them. The drill-book lays down a series of instructive experiments which can be carried on by subalterns, in which they would, for the moment, imagine themselves battery commanders and commanders, and so on right through the chain, and they would have examples before them of what would be done under certain circumstances. Any officers having these examples set for them should be able to answer questions such as to satisfy the general officer in command that they are not only thoroughly capable of taking up a battery commander's position, but also of taking a fire commander's position. This will answer one portion of Captain Monash's question. I do not regard this system as being a fallible one. At the outset, when the tactics of coast defense were first broached, many older officers said, "This will absolutely break down. Your communications will come to grief. Everything will go wrong." The answer I give to that is—that nearly all those officers who have had very many opportunities of watching coast fortresses in action have come to the conclusion that they have been unnecessarily alarmed, and that what looked very difficult is comparatively simple. As to the question of communications breaking down, in every properly organized fortress there is a second, and possibly a third system in case of a breakdown, and that system is thoroughly inculcated into the minds of everybody concerned, and all are fully prepared to deal with the second plan in view of the first failing. That being the case, I don't think we would be wise in rejecting a superior plan, especially when we have a second to fall back on.

As you will have noticed in my account of the fortress record book, it is laid down what secondary lines of communication would be in existence, what places there were for them, and what would happen in the third place—that of commanders fighting their own guns or groups on the bracket system. With regard to Major Outtrim's question about the identification of ships' colors, I may say in war time we have no colors at all. It would be narrowed down in this way: if war took place, the Admiralty and Intelligence Department would furnish here a description of every ship within striking distance, or within five or six days' sail; the identification sheets would then be sorted out, and you would keep before you only such sheets

as would be required, the rest put away in their boxes. With regard to disguises, it is admitted that the day of disguises is over; that in order to disguise herself a modern ship would have to build up a lot of wooden affairs to effectually alter her appearance, and this would be a danger to her, and would hamper the movements of the crew. I do not say it is impossible to disguise ships, because it has been done lately. Major Hanby asked for further information on the identification of ships; but my lecture on "The Identification of Ships" dealt with the question so thoroughly that I was afraid to inflict further particulars upon you to-night lest I should weary you. Major Tope spoke about the same subject, and said that while we were taking the trouble to look up a passing vessel, she may have passed away or blown the fortress into the air. He also quoted a remark by General Geary of—"Here's a ship, let's hit her." Well, gentlemen, that may be very sound advice, but I think it would be better for you to know what she was and how to hit her. Concerning Lieutenant Oakley's remark about the danger of a commanding officer's position, I should like to say that in any modern fortress the commanding officer would have his proper fighting station, and it would be something short of a miracle if an enemy were able to touch him, and the only chance of hitting him would be analogous with that of some one aiming at a house and hitting a haystack. With regard to casualties, it is distinctly laid down that drill should be practised with casualties, but, in view of the fact that there is so little time for the garrison artillery militia to do their work in, that it has been found up till now, and I think commanding officers will agree with me, it has taken them all their time to fulfill the duties they are called upon to perform in peace time, and to give a decent account of what is required of them, without taking into consideration the additional difficulties of providing against casualties. Of course, they want a longer training. With regard to Captain Monash's remark, that we are handicapped in carrying out tactics under existing conditions, I feel some difficulty, and I think I must express a very guarded opinion. I believe, knowing what I do of the qualities of the officers of the Garrison Artillery Militia, that if they got a fair chance of studying the present coastal defense system of tactics with the various data before them, which would be the very breath of their nostrils in dealing with their work, I have not the slightest hesitation in positively affirming that they would be able to fight the forts on the principles laid down in the "Garrison Artillery Manual." My own opinion is that these principles are not more difficult than a haphazard way of fighting. In conclusion, I trust very sincerely that we shall not only have our fire commanders told off to their positions, but that they will be enabled to do all that is required of them, and to give a good account of themselves by fighting their forts in such a manner as to reflect credit upon themselves and their command. I am very grateful for the patient bearing you have given me, and for your kind consideration of the disabilities under which I labor in giving this lecture to-night.

Military Notes.

TURRET OF THE BATTLE-SHIP "MASSACHUSETTS" UNDER FIRE.

AN experimental turret, representing similar structures on the United States battle-ship *Massachusetts*, was tested last spring under conditions such as will obtain in an actual sea fight, and we are now enabled to present our readers with photographic reproductions which show how it stood the ordeal.

The ballistic tests which are continually being made upon armor plate furnish very complete information regarding its ability to keep out projectiles. There is not a battle-ship in any of the navies of the world regarding which a naval expert could not tell us the powers of resistance possessed by its armor. There are other questions, however, to be considered in addition to that of the mere resistance of armor to penetration. The plate would afford but little protection unless it were well supported or "backed" by the framing of the ship itself. Even if a shell should fail to get through, there is a possibility that it will drive the plates bodily within the structure of the ship, racking and distorting the skeleton framework to which the armor is bolted. Our readers will remember the test made last year of a structure representing the sides of the battle-ship *Iowa*, which was illustrated in the *Scientific American* of November 9. The results showed that the framing had ample strength to hold the plate up against the heaviest shells.

It was felt by the Bureau of Ordnance, however, that the experiments would not be complete until a test had been made of the armored turrets of our battle-ships. The fact that the framework of the ship itself could stand the impact of heavy projectiles was no proof that the revolving turrets, which carry the big guns, would be equally secure. A slight deformation of the plates and beams of the backing, which would be of but little consequence in the fixed sides of the ship, might interfere with the working of a huge turret, rotating as it does on a circle of steel rollers, and having clearances of only a few inches between itself and the walls of the barbettes. Even if the structure of the turret itself were not distorted, it was possible that it might be moved bodily upon its supports, in which event the elaborate gear, hydraulic or otherwise, for turning the turret would be disabled, and the whole mass, with its two big guns, constituting one-half the main fighting power of the ship, become wedged in its seat and rendered all but useless.

It was determined to make a test of an experimental turret which should be practically, at least for the purposes of the test, a fac-simile of the turret of the battle-ship *Massachusetts*. A solid foundation of piling covered

with heavy timber was built, and upon this was laid a circular track of wrought iron plates, answering to the roller track of the *Massachusetts*. The experimental turret was about 27 feet interior diameter and 11 feet high. Its framework, consisting of vertical angle frames and horizontal channel irons, carried ten cast-iron plates, 15 inches thick, and one steel test plate representing the turret armor of the *Massachusetts*. Interior girders, similar to those used for carrying the gun, were built in place, and 180 tons of pig iron were so disposed within the turret as to represent the actual weights of the gun and gear. The weight of the complete structure was 450 tons, and it was carried on twenty cylindrical rollers of steel, which were prevented from transverse movement by means of wrought iron wedges. The experimental steel plate was one which had already been used in experimental tests, and had successfully resisted two heavy armor piercing shells, the points of which were embedded within it. In the present experiment three rounds were fired, as per the accompanying table:

	Round 1.	Round 2.	Round 3.
Gun.	10 inch.	12 inch.	12 inch.
Projectile	500 pounds.	850 pounds.	851 pounds.
Velocity	1683 foot secs.	1701 foot secs.	2000 foot secs.
Energy.....	9829 foot tons.	17,069 foot tons.	23,626 foot tons.

The first shell, a 10-inch Wheeler-Sterling, broke upon the plate with a penetration of 9½ inches. The point of impact was 14½ inches from the top of the plate and 2 feet to the left of the second of the points of impact above mentioned. A piece of the plate above the point of impact, 33 inches wide, was carried away, and the roof plates of the turret were wrenched upward to a height of 1 inch. The armor bolts were uninjured and there was no movement of the plates on the turret. The whole turret was moved backward on its rollers for a distance of 1¼ inches.

The second shell struck the turret at an angle of 7½° from the normal. This projectile penetrated 11¼ inches and broke up, the head remaining welded to the plate. The plate was cracked diagonally through the last shot hole and through one of the old points of impact to the bottom of the plate. One armor bolt was broken and driven into the turret. The adjoining cast-iron plate to the right was slightly displaced. The horizontal channel irons of the framework were buckled to the extent of one inch. The splinter bulkhead to the left was buckled to the extent of 3 inches. The turret itself was carried to the rear a distance of 7¼ inches, and was also turned about its axis slightly. There was no distortion of the structure considered as a whole.

The third shot was a Johnson fluid compressed steel armor-piercing shot, similar to that shown in our last week's issue, but 12 inches in diameter. It carried a soft steel cap and weighed 851 pounds. It struck the plate at an angle of 21° from the normal, at a point about 3 feet from the left edge and three feet from the top of the plate. It will be noticed that the angle of impact was very large, and when the shot struck the plate, instead of following the line of fire, it turned sharply to the right and passed entirely through the plate on a line nearly normal to its surface.

The shot broke up in forcing its way through, the larger pieces going

through the covering plate on the rear side of the turret, piercing the backing, smashing off a large portion of the rear cast-iron plate, and finally going into the woods behind the target.

The back of the ballistic armor plate was broken out for a diameter of two feet around the hole; pieces of the steel being driven through the turret and scattering in all directions. The backing was carried away and splintered; the plating behind the backing being folded back and wrecked over an area of $3\frac{1}{2}$ feet square. Rivets were sheared and flew all over the turret, leaving their marks on the interior. The channel beam at the rear of the shot hole was ripped off and thrown across the turret. A jagged hole, 7 inches in diameter, was torn through an adjoining deck beam. The interior vertical covering plates on the opposite side of the turret were pierced with eighteen holes and showed numerous deep gouges and scars caused by the flying fragments. The turret structure over an area of 4 square feet where the shot struck was badly wrecked. The backing on the rear side was wrecked and splintered and the 15-inch cast-iron plate badly cracked, two large pieces of the latter being thrown to the rear, leaving a triangular hole 4 feet high and 4 feet wide. All six of the armor bolts holding these plates were broken, and the plate itself was forced to the rear 9 inches on one edge and 2 inches on the other. This impact moved the turret 9 inches to the rear in a direction making an angle of nearly 8° with the line of the movement in the two previous impacts. It also revolved around its centre to the left through an angle of 2° . The result of the test proves that the framing of the turret has ample strength to resist the heaviest strains that could come upon it under fire. The fact that the turret as a whole moved as much as 9 inches under the energy of the shot raises the question of the sufficiency of the means adopted to hold the turrets of our battle-ships in place. As at present constructed, the tendency to translation of the turret is resisted by the flanges of the steel rollers upon which it revolves, and it is estimated by Commodore W. T. Sampson that these flanges present an ample margin of strength to resist the shearing action to which they are subjected. When the 33,000 foot tons of energy of a 13-inch shot is communicated to the turret, a part of it is expended in piercing or breaking up the plate and part of it causes the whole turret to move until the roller flanges take hold of the edges of the roller track. According to the last authority, the pressure of a 13-inch gun against its recoil cylinders when it is fired brings a strain upon the roller bearings far greater than they can ever experience under the momentum of a heavy shot. Altogether this very interesting test establishes the excellence of the system of turret construction as carried out in our new battle-ships.

Referring to the destruction wrought in the interior of the turret by the flying fragments of the successful shot, it is evident that had the turret been occupied by actual guns and gun crew, the gun itself and the larger part of the crew would have been disabled. It is also noteworthy that successful penetration was effected in spite of the fact that the shot struck at a high angle of incidence, and there is no doubt but what it was largely due to the action of the soft steel cap, as explained in our last issue.—*Scientific American*.

HORSE ARTILLERY AND CAVALRY.

A lecture at the Prince Consort's Library, Aldershot, was given by Major E. S. May, Royal Horse Artillery, on the above subject. Major May at once proceeded to briefly sketch the origin and the *raison d'être* of the Royal Horse Artillery, and also the great necessity which to-day existed for great mobility on the part of field artillery, so as to cover extreme distances at an unbroken pace. The duty of the Royal Horse Artillery, he considered, in a big battle of the future, would probably be that of effecting wide turning movements, in conjunction with the cavalry. They would find that they could procure examples to illustrate almost every feature of war from the battles of 1870. Having quoted a number of such instances, the lecturer said that he was sure that one such instance would afford great pleasure to his friends of the cavalry regiments, namely, where, on the occasion when the French infantry were being driven back by the advance of the German Twenty-second Division, near Neuveville: to cover their retreat before the advance of the German Twenty-second Division, a twelve-pounder battery of the Reserve Artillery came into action. The movement was observed, and a squadron was signalled to approach and be concealed, and when it was ascertained that they were certainly guns, this squadron rushed out and seized them before they could possibly recover and come into action. It was a splendid achievement, and was only an instance of what could be done by surprise. He felt sure that its lesson would be appreciated by the officers of the cavalry regiments present. The lecturer proceeded to give similar illustrations as to the part that could be played by the rapidity of action in flank movements, the study of which would well repay attention on the part of officers, and valuable deductions in almost every sphere of tactics could be drawn from them. The operation of the 2d of December, in 1870, was treated at length by the lecturer, and particularly the incidents which immediately preceded the attempt by the French to relieve Paris. Estimating the German performance in its various aspects, he pointed out how the German batteries, by the opportune movements which they effected, stemmed the rush of French advances and forced the hostile skirmishers while their comrades rallied behind their guns; and how subsequently they repeated the process when they fell back on to their second position—it was here that the artillery manifested itself. The lecturer sketched in outline some of the positions occupied by the troops in this memorable campaign, showing that in all cases a frame of work of advanced artillery really constituted the backbone of the situation, and that the *morale* effected by this judicious employment of the artillery arm was mainly instrumental in accomplishing the well-known results of the campaign. It rested, however, in the union which could be effected between the cavalry and the horse artillery arms as to how far those advanced and frequently important operations could be successfully conducted, particularly when flanking movements were contemplated. The rapidity of fire and the precision of modern ordnance, with the introduction of shrapnel in place of case-shot, while retaining many of the principles on which horse artillery and cavalry had previously acted, had yet altered the situations occurring each moment during the earlier stages of the combat, but mainly

in one direction, namely, of increased mobility. The lecturer advocated increased mobility for the field artillery arm to cope with the altered conditions, but pointed out the unique place in which horse artillery must still occupy in the battles of the future. The illustrations he had given were not numerous, but they were based upon the opinions of such authority as Prince Kraft. He trusted that he had shown that the horse artillery arm, with the assistance of modern innovations, such as mounted infantry, would have to play such an important part in the various stages of a battle action that nothing but combination could insure success.—*United Service Gazette*.

THE STRENGTH OF THE BRITISH ARMY.

According to the latest returns received on January 1 of the present year, the general total of Regular troops at home and abroad was 221,194, of whom 106,100 were at home, 33,644 in the colonies, and 78,043 in India, while to aid in the grand work of restoring prosperity to Egypt, which we have taken in hand, there were but 4407 Regular troops retained in that country. The average number of men in the army during last year was the highest on record for the last twenty years, being 220,309. Of these 19,536 were cavalry; 37,124 artillery; 7664 engineers; 5905 foot guards; 137,233 infantry of the line; 5009 colonial corps; 3487 army service corps; 1165 ordnance store corps; 2541 medical staff corps, and 555 army pay corps. We have here a very strong proof that the efforts that have been made to improve the position of the soldier and to increase his comforts are bearing fruit, for there has been no special depression in trade to account for filling up the ranks as has in some other years been the case. The total number of recruits, however, obtained last year was 29,583, of whom 29,194 were raised at home, a smaller number than in any year since 1889. Scotland and Ireland account for only 2892 and 3145 respectively, the rest being provided by England and Wales.—*United Service Gazette*.

COL. SLADE ON THE LEE-METFORD.

SIR:—In the *Spectator* of Oct. 17 there appeared a letter signed "C. M.," and with your permission I should like to answer the first portion of it, viz., that relating to the bullet of the service rifle. The Lee-Metford rifle was not introduced hastily into the service, nor "was it adopted on account of its trajectory only." The Small Arm Committee had the whole question under consideration for upwards of three years and subjected the rifle to the most exhaustive tests. The trials to ascertain the smashing power of the small bullet and its penetration into steel plates, sand, rammed earth, balks of timber, and other substances, convinced the Inspector-General of the Cavalry and all the officers of the Army Medical Staff and the Veterinary Department who assisted at the trials that cavalry would fare no better against the 0.303 in. bullet than against the 0.402-in., the War Office having decided in 1885 to adopt the latter calibre. The Martini-Henry bullet often failed to stop by shock the Soudanese Arabs and the Zulus, many of whom charged right up to our men when struck in a non-vital place and having no bone broken; and to stop a horse or a savage by shock alone would require a bullet as large as an orange. In savage war-

fare a few isolated cases will occur of individuals coming on although struck by one or more bullets, but the result of an engagement would not be affected. To go back to a large-calibre rifle would be a retrograde step and a deplorable error. All the Continental powers have deliberately adopted a small bore, and in one or two instances of late years a still smaller calibre than ours, viz., 0.256, has been taken. In addition to the many advantages possessed by a small-bore rifle over the Martini-Henry it was a political necessity, as every nation in Europe had adopted, or was about to adopt, a small bore, and England cannot afford to lag behind her neighbors in matters of armament. The Lee-Metford rifle at the time of its introduction in 1888 was probably the best military rifle in Europe. Since then inventors have not rested from their labors, and it is possible that the time has arrived when we should reconsider the question of the infantry arm, but not in the direction advocated by "C. M." The Lee-Metford rifle is not a perfect weapon, but it is a thoroughly sound and reliable arm; still it is capable of improvement. The chief faults are excessive weight and the time required to load or charge the magazine. As regards the bullet, steps have already been taken to increase the stopping effect, but penetration will be sacrificed and possibly extreme accuracy; that, however, is of little account. "C. M." may rest assured that we shall never resort to a larger calibre; the advantages of the small calibre are so overwhelming and may be summed up as follows: Greater extent of ground covered by fire using the fixed sight only, diminished recoil, increased penetration, greater accuracy at all ranges, and lightness of ammunition, allowing of 115 rounds being carried for the same weight as seventy Martini-Henry rounds. The rifle of the future will probably be of slightly smaller calibre than 0.303, will weigh 2lbs. less, and the magazine, holding eight cartridges only, will be capable of being charged either by putting in all eight cartridges at once or one by one as desired. C. G. SLADE, Colonel, late Member of Small Arm Committee.—*The Army and Navy Gazette*.

A REMARKABLE MARCH.

General Grodekoff, a Russian general who made a name by a ride to Herat some years ago, and now holds a command on the Amur, gives an interesting account of a remarkable march of nearly 5000 miles made by Russian troops. This account appears as an order of the day in the *Invalide Russe*. "After a march of nearly a year's duration, the 4th and 8th Battalions of the Line of Eastern Siberia, as well as the 2d and 4th Batteries of the Artillery Brigade of Eastern Siberia, arrived in their new encampments in the Amur district in the middle of June. These troops marched over 7000 versts (say 4700 English miles), of which 4000 were by land and 3000 by water. The most trying part of their journey was that accomplished on rafts between Chita, Stretensk, and Blagovestchensk, or about 1500 versts, between the middle of May and the middle of June. The weather was cold and rainy, and the rivers were very swollen and their current rapid. To overcome these difficulties, the men had to work 14 hours a day. At certain stages of the journey the body of the troops covered an extent of 20 versts between the advanced and rear guards. During the

whole of the march the losses were only two officers and four soldiers dead, two officers and 25 men left behind in the hospitals along the route. The batteries lost 29 horses. After their arrival I reviewed these troops on three separate occasions, and found the men in good condition and excellent spirits. Two hundred years ago another Russian force made a similar march to defend the fort of Albazin against the Chinese in this very same Amur region."—*United Service Gazette*.

VON MOLTKE'S MILITARY CORRESPONDENCE.

The Prussian General Staff has just published the second part of the third volume of "Count Moltke's Military Correspondence, from September 3, 1870, to January 27, 1871." In a letter to the Emperor, dated December 1, 1870, Moltke says:

"The question when a bombardment of Paris shall or can begin must be decided on military grounds. Political reasons can be taken into consideration only in so far as they do not entail anything inadmissible or impossible from a military point of view. The former would be the case if politics were to dictate the commencement of the cannonade before the means required for carrying out the same were at hand. The latter—that is to say, the requiring of the impossible—would be the case if the speedy placing in position of the necessary material were demanded in face of the fact that the French had successfully obtained a large number of heavy guns, with the requisite ammunition, from Cherbourg, Lyons, or Toulon. The 'military men' who support the demands of the political party seem, according to the report of the Federal Chancellor, to have overlooked the fact that the Government of Paris had, for the purpose alluded to, absolute control of several railway lines, whereas the heads of the Prussian army had at their disposal only one line, which was exposed to infinite disturbances of traffic, and which, up to quite recently, only ran to within sixty or seventy miles of the position of the siege park. In this alone lies the sole explanation for the delay of the artillery attack. The enclosures (No. 1, Report of Colonel von Rieff from Versailles, dated November 28, 1870; and No. 2, Accompanying Report of the Commander-in-chief of the Third Army, dated November 30, 1870) are more explicit on this subject, and explain how, in spite of assistance provided by the horses of the ammunition columns, by the teams of the commissariat wagons, and requisitions from the vehicles of the country, it has not, as yet, been possible to bring about the much-desired advance of the heavy ammunition, which alone weighs from 2500 to 3000 tons. It must be acknowledged that an extensive use of the horses of the ammunition columns might tend to restrict the army's freedom of action. Nor should the teams of the Commissariat Corps have been used to any great extent. How difficult it has been to obtain requisitions from the vehicles of the country, and how little the latter are in general adapted for the transport of the heavy siege ammunition, is explained more fully in the enclosures. From these there can be no doubt that, up to the present, a more expeditious advance of the ammunition has not been feasible. The extension of the railway to Lagny, the bringing of suitable carriages from Berlin, the further temporary disposition of draught horses from

the ammunition column contemplated by the Commander-in-chief of the Third Army, and the possible hiring of 500 to 1000 two-horse wagons (for the transport of which to Lagny about thirty railway trains will be required) through the contractor, Hugo Knopf, of Erfurt, also proposed by the above-mentioned officer, will probably make it possible to commence the bombardment of the forts at the south front by the middle of next month. This is, however, regarded as the last resort for overcoming the resistance. Close investment and starvation must at the start be considered as a sure, if slowly operating, means for the accomplishment of the end in view. As, moreover, the campaign will be decided not here but when the enemy's troops now operating in the open country are beaten, it would not be advisable to carry the formal siege beyond the cannonading of the forts, which would demand great sacrifice of men. As regards, finally, the projected secondary attack on the north front of Paris, the same difficulties would have been encountered, up to a short time ago, in arranging the preliminaries as has been the case with the south front, viz., the obstacles in the way of bringing up the ammunition."

CAVALRY SCOUTS.

The *Invalides Russes* has recently published new regulations concerning the constitution of the special body of cavalry scouts, which have been approved by the Czar on the advice of the Council of War. This is a matter that has long received very careful attention in Russia, where it is maintained that the work of scouting can only be confided properly to picked men, of assured intelligence, physically vigorous, with keen sight and excellent hearing, who have been subjected to special training. Of such selected men sixteen will serve with each squadron, and will receive the prescribed instruction, which will be given also to all non-commissioned cavalry officers. In order that the best men may be secured for the service, the principle of selection will operate continually. Those who prove inapt will be replaced by others, while men who display high powers during a continued period will receive a special badge on the shoulder-strap, and will enjoy particular advantages. Great care is bestowed upon the mounting of these scouts, and their training is directed in each squadron by an officer selected for his special interest in scouting and his physical aptitude for the work. One advantage given to the scouts is that, after two years' service, they will be promoted as supernumerary non-commissioned officers, without having gone through the special training grade, on the condition that they remain on the roster for scouting duties.—*United Service Gazette*.

NEW 9.2-INCH WIRE GUNS.

Five new land-service 9.2-in. wire guns of special pattern are now being completed in the gun factories of the Royal Arsenal at Woolwich. They are the longest guns, in point of number of calibres, that have ever been built by the British government, being 44½ in. in length—only ½ in. less than the 12 in. or forty-six tons—or 48½ calibres over all. Whilst upon the lathes, which have been put up in the recently-erected shops, these guns look very remarkable, as their diameter outside is small, and one almost expects to see them lowered into the shrinking pits in order to have an-

other jacket passed over the breech. This reduction of diameter is extraordinary. It has, of course, been obtained by a vast extension of the employment of wire in their construction. We only trust that the authorities are not going too far in this direction; at present it seems as if the whole substance of the new guns was being made up of wire. We understand that a distinction is being made between the land-service and sea-service 9.2 in. guns in this respect, the latter being wired all along the tube, or "tube-wired" as it is called, whilst the guns now under consideration are not treated in this way. It will be remembered that the *Powerful* and *Terrible* have four 9.2 in. guns of the new pattern. They are 4 ft. 1 in. less in length than the land-service weapon.

The rifling of these guns increases from 0 to a sharp pitch at the muzzle, so that as there is a complete revolution of the grooves within the bore the view of the spiral from the breech is very curious. The breech gear is similar to that of the 12 in. wire guns, except that more gun metal is used in its construction and, instead of a hand-wheel, there is a winch handle for opening and closing, with a heavy gun-metal ball to balance it upon the opposite side of the spindle. The firing gear, which is both for percussion and electric systems, has separate locks for each system of the simplest character, which can be adjusted or detached in a moment.

The initial, or rather muzzle, velocity of the sea-service 9.2 in. gun of the new pattern is 2347 foot seconds, with a total muzzle energy of 14,520 foot tons, but the extra 4 ft. 1 in. of bore in the land-service gun will enormously enhance the value of these features, as a larger quantity of cordite can be consumed before the projectile leaves the muzzle of the weapon.

We understand that it has definitely been decided to adopt the improved 9.2 in. gun as a medium between the 6 in. quick-firer and the 12 in. 46-ton wire gun, and that the manufacture of further 10 in. guns will not be proceeded with at present, at least for naval service. This is a most sound principle to adopt, as the fewer classes of gun there are, the easier it is to reduce the quantity of stores and gear which are indispensable for their repair and maintenance on board ship, and the less chance is there of confusion and mistakes occurring in regard to those stores.

The mountings for the guns of the *Terrible* and *Powerful* are somewhat complicated, but not so much so as earlier ones for guns of this calibre. They can be worked either by electricity or hand gear. Heavy shields or hoods surround and enclose the guns, being 6 in. thick in front and thinning off to 4 in. at the sides. They are of nickel steel and not carbonized, we understand. Five of these mountings have been made, four for the two great cruisers and one for reserve.—*Army and Navy Gazette*.

SPAIN'S MILITARY STRENGTH.

The effort made by Spain during the campaigns in Cuba and the Philippines has been prodigious. Thousands of young men filled with high ambitions and inspired with true patriotic fervor have gone forth to be shot down in guerrilla warfare, to die by pestilence, or to sicken away in fever, bred of miasma and want. High credit is due to General Azcarraga, and it cannot be attributed to him that the training was insufficient, and that

generals long proved unequal to the difficulties of their task. In Cuba, including the reinforcements of the eleventh expeditionary corps, but without counting volunteers, there are 107 battalions of infantry, six guerrilla companies, three of the Guardia Civil, one disciplinary brigade, four squadrons of cavalry, two regiments of mountain and two battalions of field artillery, and two battalions of sappers, besides battalions of telegraphists, railways troops, etc., numbering in all some 200,000 officers and men. The strength in Porto Rico is about 6000, and the *Revista Técnica* has lately given the force in the Philippines at 36,760, of whom over 14,000 are native infantry. At home there are with the colors 64,190 infantry, 14,346 cavalry, 11,774 artillery troops, 5294 engineers, and 2400 men of the Army Service establishment, making in all, with 14,679 of the Guardia Civil and 14,186 gendarmerie, a total of nearly 129,000 officers and men. Thus Spain has at present in the field and at home an army of more than 371,000 men, and has given evidence of great physical resources and of national energy that should bear good fruit in establishing her position among nations.—*Army and Navy Gazette*.

THE MANŒUVRES IN GALICIA.

The *Reichswehr* of Vienna gives an account of the various innovations at the late grand manœuvres in Galicia. For the first time telephonic sections were attached to the army corps, each being supplied with the apparatus necessary for the establishment of three stations, and sixty kilometres of wire. The appliances were similar to those used in the telegraphic service of the cavalry. A trial was also made of dried sauerkraut and preserved vegetable soup for the men. A kilogramme of the first supplied fifty or sixty rations, and required to be boiled for an hour before using. It seems not to have been greatly liked. A kilogramme of the vegetable soup provided rations for 350 or 400 men. Several various models of filters were also under trial, and sundry methods of purifying water. Lastly a new system of supplying ammunition in the field was tested, small carts carrying twenty cartridges per rifle accompanying the men.

NEW CANET FIELD GUN.

The principal modification introduced by M. Canet in this gun is that the trail is itself a break, which minimizes the shock caused by the running back or recoil of the gun. This trail is composed of two concentric tubes of hammered steel, which are able to penetrate or envelop each other reciprocally during the recoil. The first tube which is joined to the carriage is the largest, the second forms a piston, terminated at its lower end by an inclined or sloping spade which, as it penetrates the earth, creates the fixed point necessary for the piece to be brought into action. This second tube also contains the hydro-pneumatic break. As the gun is fired the spade digs itself into the soil, the movable part is driven back, and telescoping on towards the breech, works the hydro-pneumatic break. As soon as the force of the recoil is deadened, the air which has for a moment been compressed, regains its elasticity, and the gun automatically resumes exactly the same position which it occupied before discharge. In case of change of

aim, to turn the gun in another direction one has only to lift up the spade, which by the fact of the heaping up of earth caused by the shock of recoil is in itself disengaged and no longer sticks in the ground. So that thus is saved the great loss of time which gunners forcibly had to put up with whilst the gun was being run up and re-aimed after each discharge.

In appearance this gun somewhat resembles our breech-loading 13 pdr. field gun, but, the trail being cylindrical and telescopic, resembles another gun with breech under the real gun and muzzle to rear. The head of the spade is covered with a sort of platform, in shape like a skate's back, on which the trail rests. The platform itself—which before the gun is fired is raised some 8 in. off the ground by the spade attached to it at an angle of about 45 deg.—sinks on to the ground itself as the spade becomes embedded after the discharge. Thus the trail of the gun after firing looks, and is indeed, fixed to the ground, in the same manner as the tripod legs of a quick-firer are bolted down to the deck on a man of war. Four horses, with two drivers, draw the field piece; the draught is pole draught; the sabres of the drivers are attached to the saddles.—*Army and Navy Gazette*.

STATISTICS OF 1870-71.

The German papers publish statistics respecting the number of German soldiers wounded in the war of 1870-71. The total is given at 116,821. Almost 96,000 men survived, but the greater portion of them were practically unfitted for the every-day warfare of existence. The statistics as to the various kinds of wounds received are suggestive. Most of those caused by bullets were in the head or the chest and back, and amounted in the head alone to 11,041 and in the latter to 11,495. The wounds by rifle bullets more than doubled those caused by artillery, but more curious figures are those concerning sabre cuts. Only fifteen out of 2000 injuries to the face were traceable to the sabre, and it would seem, therefore, that cavalry charges are the least deadly of any of the methods of war, merely dispersing or disorganizing the enemy rather than killing them. The jawbone, again, seems to have a special attractiveness for rifle shots. Injuries to the jaw appear to be so numerous in war as to verge on the phenomenal. They are nearly always serious; a large proportion ultimately prove to be fatal. Those people who recover seldom do so entirely. Speech is often taken away wholly, or the power to eat, or the ability to masticate the simplest of food. Almost 50,000 injuries on the German side were in the lower extremities, mainly resulting from bursting shells, cannon balls, and rifle shots; but it is next to impossible to obtain trustworthy statistics on this head.

TEST OF SEARCH LIGHTS.

With the object of applying a practical test to the value of search-lights as a protection to the entrances to Plymouth Sound, a series of experiments have lately been carried out in which the military forces had the assistance of the torpedo flotilla attached to the port. For some time past the officers connected with the Submarine Mining Establishment of the Royal Engineers at Elphinstone Barracks, Plymouth, have been giving their attention to the distribution of a system of electric lights arranged so as to cover

the two approaches to the port of Plymouth and the entrance to the Hamoaze. Previous to these experiments no actual test of the scheme had taken place, and it is hoped to obtain some reliable data as to the efficient working of the scheme, and also whether it is capable of being improved. Owing to the experiments and arrangements connected therewith being confidential, it is impossible to give any official details; but from observation and other sources a good deal has been gathered with reference to the experiments, to which considerable importance is attached. The torpedo-boat destroyers *Skate*, *Ferret*, *Lynx*, *Opossum*, and *Sunfish* left Devonport about 4.30 P. M. for Plymouth Sound, with the object of returning to the harbor by passing through the areas defended by two of the powerful lights at Picklecombe and Garden Battery under Mount Edgecumbe. The Royal Engineers and Royal Artillery furnished observers at Drake's Island, the Breakwater Fort, Penlee Point, the Redoubt, Maker, Rovisand, Staddon, and some of the other defenses, for the purpose of taking rapid and accurate observations of the movements of the torpedo-boats. The experiments the first night were limited to the western entrance of the sound and harbor, and witnessed from a good point of vantage they were to all appearances most successful. The lights at Garden Battery commanded the whole of the waters of the sound as far as Drake's Island, and notwithstanding the weather was of the worst description for experiments of this kind, it was possible from the shore to discern small objects afloat. As the destroyers came within range of the defined area they were at first only faintly visible, but as they approached the fierce light which beat upon them from the Garden Battery, they were distinctly seen from stem to stern, and in actual warfare no difficulty would have been experienced in disabling them from one or more of the numerous defenses guarding the western side of the fortress. In continuation of the recent experiments at Plymouth, a trial on a smaller scale was also made at the Needles, when the destroyers *Daring* and *Starfish* were employed, with instructions to rush past the Cliff End batteries on the Isle of Wight side and the Hurst Castle fortifications on the mainland, the channel being little more than half-a-mile wide. So strong was the glare of the light that for a distance of three or four miles the look-out was practically blinded, and it was only by intimate knowledge of the locality that it was possible to steer the vessels past buoys and other obstructions. The vessels were under orders to first pass the lights, and then to make a dash on Portsmouth, the gunners in the forts opening fire on the boats the moment they came within observation. The *Daring* shot past the forts unobserved, and the artillery officer in command has since inquired how it was done, as the *Starfish* was under fire for three minutes and three-quarters. Now in going out to sea the vessels steamed at 18 knots, four cables apart, and, assuming they adhered to this formation, there would have been no difficulty in detecting them; but the moment the *Daring* got outside the Needles she covered all her scuttle lights, extinguished her bow lights, and put on full speed, so that she passed the forts before she was expected, and, having no lights, eluded suspicion. The experiment, small in itself, is not without importance. If the raiding boat is only to make a rush at the moment she is expected there is small

chance of her success; but in this instance, by putting out her lights and anticipating expectation by a few minutes, the *Daring* evaded the watch. It is uncomfortable to think that the *Daring* did precisely what an enemy would do, and that she was successful.—*The Times and Naval and Military Record*.

THE NEW WATERPROOFING SYSTEM.

The War Office awaits the result of the experiments which are being carried out practically in South Africa to test the merit of the new waterproofing system of which a good deal has been heard lately. The British Millerrain Company have supplied 30,000 blankets to the troops in Rhodesia, in addition to millerrained serges and greatcoats. The advantage claimed for the millerrained system is that all material treated under this patent process retains its porosity and yet is impervious to moisture. A blanket, for instance, can be used as a bucket to carry water, while the heaviest rain runs off "millerrained" khaki and canvas, scarcely damping the surface. It may be possible, if the reports from South Africa are favorable, to dispense altogether with waterproof sheets, which are a heavy item of expense.—*Army and Navy Gazette*.

Comment and Criticism.

I.

"Proper Military Instruction."

Major A. L. Wagner, A. A. G.

THOUGH the readers of the JOURNAL OF THE MILITARY SERVICE INSTITUTION may not always be prepared to applaud the logic or accept the theories of a prize-essayist, they do at least expect to find in a paper which has received the honor of the gold medal the plain merit of accuracy and fairness; and I regret to say that, so far as it relates to the Infantry and Cavalry School, this expectation is disappointed in the essay now under consideration. Space will not permit a discussion here of all portions of this remarkable paper; and, indeed, a rectification of the mistakes of its author in regard to the Fort Leavenworth School will occupy all the space that could reasonably be asked by a single reviewer.

When the essayist begins his remarks about the school with the statement that "through the devotion and ability of its superintendents and instructors it has reached a high state of efficiency," and then proceeds to attempt to demonstrate that the system and curriculum are all wrong, and that the officers on duty at that institution have failed to grasp its true objects or to conduct it properly, the inconsistency is calculated to cause amusement or to provoke indignation according to the mood of the reader; but in either case the emotion is coupled with amazement that a paper containing so much error could receive the approval of a board of award.

The essayist seems unwilling to include the Infantry and Cavalry School among our post-graduate schools; for he says, "We have such schools for the engineers and artillery, and all officers of these arms are required to attend them. We have excellent service schools for the infantry and cavalry"; and again he remarks of the Infantry and Cavalry School, "It is not wholly a post-graduate school, as many of the student officers have been promoted from the ranks or appointed from civil life." If we regard a post graduate school as one limited solely to the instruction of graduates of the Military Academy, the Infantry and Cavalry School does not merit that title; but then neither does the Artillery School, for its alumni are not all West Pointers, and in its list of honor graduates can be found the name of at least one officer who was appointed from civil life. If the term be applied, as it should properly be, to an institution whose curriculum is an extension of the course at the original school, then the Fort Leavenworth School does deserve the title; for, with the exception of the course in law, and a very small portion of the course in engineering, it is an extension, an amplification, and (so far as infantry and cavalry are concerned) a completion of the West Point course. An examination of the text-books and present methods employed at Fort Leavenworth in connection with those in use at West Point will make this clear to any one who cares to investigate the matter.

Captain Pettit finds the information conveyed by paragraph 33 of the Programme of Instruction "astonishing," because practical exercises do not have as high a value as he would give them relatively to theoretical instruction, and because the Departments of Infantry and Cavalry are not given a preëminence among the departments of the school. Let us examine into the matter, and see how far his astonishment is justifiable.

The objection to the low rating of the Departments of Infantry and Cavalry is evidently based upon the assumption that they should include the subject of minor tactics, and that that important branch of military instruction, not being found in those departments, is held in slight esteem, or ignored altogether, at the Infantry and Cavalry School.

It so happens, however, that an extended course, not only theoretical but *practical*, in minor tactics is given in the Department of Military Art, which fact should have been known by the essayist, as he has evidently had access to the programme of instruction. The subject of minor tactics has not been assigned to the Department of Military Art without good cause. In the Departments of Infantry or Cavalry instruction could be given in the minor tactics of the arm pertaining to that department; but to which department should the subject be assigned when it includes the three arms combined? What justification would there be in giving precedence to either department over the other? In the course in military art instruction includes the minor tactics of each arm, and of the arms combined, both arms being on a perfect equality, and the practical exercises following or accompanying the theoretical instruction given in the same department. Nothing could possibly be gained by a transfer of the subject of minor tactics to the Departments of Infantry and Cavalry; and when the essayist would elevate those departments to the chief rank in the school, it is evident that he does not appreciate the existing conditions, and that he is influenced by names rather than facts. He says, "Fortification, topography, signalling and photography, are adjuncts to a military education, but we cannot for a moment admit that they are even equal in importance to the training and instruction of the young officer in the minor tactics, administration, and discipline of his own arm." Now, so far as I am able to learn, nobody admits that they are equal in importance, or wants to admit it. The essayist's supposition that they are held in equal importance at the school is based evidently upon his failure to observe that the subjects of minor tactics and administration are included in the Department of Military Art, and that the student is presumed to have been instructed in "the discipline of his own arm" before he is detailed for duty at the school.

Now when we consider what the courses in the Departments of Infantry and Cavalry really embrace, and consider that the course in engineering comprises not only the "adjuncts" of fortification, signalling, and photography, but the subject of topography as well, the relative values assigned to the departments does not seem to be at all in need of rectification. These "adjuncts" are not all to be despised. Captain Pettit must surely understand the incalculable value of the study of military topography as affording a means of acquiring a knowledge of the terrain in military operations; and as to the importance of such knowledge, he is respectfully referred to his own essay on "The Terrain in its Relations to Military Operations" for which he received honorable mention in 1892. In that essay he quotes the views of Nigote, Lewal, Guichard, and Von Scherff in regard to the importance of the study of the terrain, and asserts that "to this testimony we may add that of every modern military writer of note." He himself declares that it is the "primer in the education of our troops for war"; that "the great importance of practical and theoretical study of the terrain can not be too strongly impressed on officers and men of every grade and every arm of the service," and that "it is an indispensable part of the training of every professional soldier worthy of the name." How does it happen that this great subject has now become a mere "adjunct" to be regarded so lightly?

"During the first year," says Captain Pettit, "the infantry officer should be instructed theoretically and practically in the principles of combat, advance and rear-guards, outposts, patrols, drill regulations, marches, escorts, reconnaissance, administration, fire tactics and fire discipline,—for infantry alone. Beginning with the squad he should progress to the battalion." The inference to be drawn from the above is that the subjects enumerated are not taught at the school. In point of fact, every feature of instruction enumerated above has been taught at Fort Leavenworth for some years in an extended *practical* course, as Captain Pettit could easily have ascertained if he had taken the trouble to consult the reports of the several commandants, or to inform himself in regard to the institution before turning on his flood of criticism. In one respect, however, the course differs from that suggested by Captain Pettit. He declares that the practical work should begin with the squad and progress to the battalion. Now, right here, he has failed utterly to

grasp the fundamental object of the Infantry and Cavalry School, namely, *to give instruction in those subjects which cannot be learned with equal facility or equal thoroughness at ordinary posts.* Captain Pettit recommends that every second lieutenant have two years' duty with his regiment before he be sent to the special school for his arm of the service, and at present the average length of service of the student officers greatly exceeds this. Provision is made for the instruction of lieutenants at their posts by paragraphs 185 and 252, Infantry Drill Regulations. Is it to be supposed that the instructors at an ordinary garrison are so incompetent, or that the second lieutenants are so stupid, that after two years of regimental service, subalterns must be sent to a special school to receive instruction in the drill or the tactical handling of a squad? What justification could be found for an expenditure of public money in maintaining a school for the instruction of officers in duties which they are, and should be, expected to know thoroughly as an incident of their regimental training? In the exercises in both drill and tactics, the students at Fort Leavenworth are given practical instruction in the duties of all the grades from second lieutenant to battalion, squadron, or regimental commander, but the school is not maintained for the purposes of squad drill.

Captain Pettit would have a similar course for cavalry officers "with the addition of equitation and hippology." The entire course which he prescribes, including hippology, is now given to all students at Leavenworth, both infantry and cavalry. The authorities at the Infantry and Cavalry School have never yet seen any reason to limit cavalry instruction to cavalry officers, nor can any reason be found for so doing, unless we assume either that infantry officers do not need a knowledge of cavalry duties or else that they are incapable of acquiring it. As to the first assumption, Captain Pettit himself says in his essay: "Our military policy demands that our officers be instructed for duty in all arms of the line. Sheridan was in the infantry when the war opened; Howard was in the ordnance, McPherson was an engineer. If war should come upon us now we should have to increase our cavalry and our field artillery. We should need trained officers for them at once, and would have to draw them from the infantry, as we could fill vacancies in that arm more acceptably. An officer in our army can hardly foresee the nature of his service in time of war; his training must therefore be broad and extensive"; and again, "Our military policy demands the general preparation of all officers for any service it may be convenient to assign to them." As to the latter assumption it is sufficient to say that infantry officers have twice headed the class in cavalry instruction, and that at the last examination a second lieutenant of infantry passed highest in the practical work of the Department of Cavalry. As to instruction in equitation, it is not deemed necessary for cavalry officers of two years' service, and of the infantry officers very few indeed have any need of this instruction when they arrive at the school. It should be emphasized that the students at the Infantry and Cavalry School are neither boys nor recruits, and that the instructors have other work than that of drill-sergeants.

The comments of the essayist on the detailed programme of instruction in the Department of Military Art, if not made ignorantly, must be characterized as unfair, to use the mildest term applicable in the case. The sub-divisions which he enumerates so prominently are merely explanatory sub-heads, similar to those which indicate the contents of a book, and are no indication of the relative amount of time given, or the relative importance attached, to the different subjects. It was not supposed that any intelligent officer would infer from these sub-heads that because strategy has twenty-four sub-divisions, and the exercises with and without troops only three, that more time was necessarily, or even probably, devoted to the former than to the latter. As well might we conclude that because a little book on "The Elements of Military Science" has twelve chapters and Jomini's "Art of War" only seven, that the former is a larger and more important work than the latter.

Speaking of the exercises without troops, it is a pity that the essayist did not take the trouble to investigate that branch of instruction at Fort Leavenworth. He would have

learned that the scheme which he sets forth on p. 48 of his essay has been in use at the school for some years, though the maps employed have shown a less fantastic topography than the one with which he illustrates his theme.

The essayist says: "If this course is thoroughly taught there will not be much time for individual training in infantry and cavalry, and the name of the school should be changed to War College, and it should be opened to officers of all arms." I am satisfied that the instruction is as thorough as that at West Point or Yale, and I am equally satisfied that there *is* time for all the individual training in infantry and cavalry that could properly be made a part of the course of instruction at the school. As to changing the name of the school to War College, I do not think that would be at all objectionable. The name of the school is a matter of slight importance. "A rose by any other name would smell as sweet." Those who have shaped the policy of the Infantry and Cavalry School have sought to make it an institution of value to the army and the nation. If in aiming to attain this end, they have found other departments more valuable than those bearing the distinctive appellation of infantry and cavalry, it does not follow that any harm has been done by giving the highest rating to the most important departments. If, as a result, the institution should, in the interests of consistency be called a War College, well and good. By all means let us change the name, if only to please captious critics, and to encourage them when they show a disposition to be consistent.

"It is," says Captain Pettit, "the old West Point idea that in case of war we are all to be generals; consequently, strategy, grand tactics and logistics usurp the time and labor which rationally belong to the company and the battalion. We do not seem to be able to overcome a desire to begin at the top instead of the bottom." The essayist has here fallen into an error as complete as it is inexcusable. "Strategy, grand tactics, and logistics" do *not* "usurp the time and labor which rationally belong to the company and battalion." The course in strategy, logistics, military history and military geography, is all comprised within the last seven months of the course in military art. The rest of the time is devoted to theoretical and practical instruction in tactics.

Now, as to this "old West Point idea," let us look into it a moment. I touch upon the subject of West Point with diffidence, for it is nearly twenty-two years since I was graduated at that institution, it is some years since I last visited it, and I do not wish to indulge in criticism of an institution of whose present condition I may not be correctly informed. If, however, the text-book on the Art of War now in use there be any criterion, the "old West Point idea" must have undergone a change, for out of 293 pages, I find only 21 devoted to strategy, and 25 to logistics. The rest of the book is devoted mainly to tactics. In Captain Pettit's little book on "The Elements of Military Science," which contains only 199 pages, and is intended for the use of school-boys, I find 15 pages devoted to strategy and 18 to logistics. A simple calculation will show that the essayist seems to be more deeply imbued with the "old West Point idea" than the good people are at West Point. Moreover, in the scheme which he proposes as a model for lyceum instruction the greater part of the "work for the evening" relates to the duties of the commander of the advance guard of an army corps, who, under the given circumstances, would be a brigadier general at least. Verily, "We do not seem to be able to overcome a desire to begin at the top instead of the bottom."

In commenting on the course at the Infantry and Cavalry School, the essayist says: "The tendency of an elaborate system of theoretical instruction is to make war appear complicated and abstruse; and to divert the attention of the student from his present rank and duties to an idle contemplation of the remote possibilities of the future." Now the tendency at the Leavenworth school is not to divert the attention of the student from his present rank and duties to an *idle* contemplation of anything. The course is not an "elaborate system of theoretical instruction," though theory is not placed in the same category with anarchy, the bubonic plague, and other things hurtful to the usefulness or happiness of man. Rational

practical instruction must be based on sound theory ; and it may be remarked that the only people whose conduct is not based upon theory of some kind are found in asylums for the feeble minded. Moreover, it is not regarded as either criminal or absurd to encourage a young officer to keep in view the possibility that he may some day be a general and that he may then possibly profit by a previous study of the experience of other commanders. The essayist says : " We need go no further than the War of the Rebellion for ample proof that soldiers are frequently born and rise to eminence through inherent qualities, and without the advantage of previous military instruction." This is very true, and the members of the board of award are themselves conspicuous proofs of the correctness of the statement ; but nobody knows better than Captain Pettit that in that conflict all the pre-eminent generals were men who had had the advantages of previous military education. Military science is not unlike other sciences. Occasionally a man achieves fame and distinction as a *savant* who never went to college. But, because Franklin and the elder Herschel were eminent in the world of science, we would scarcely be justified in seeking philosophers among truant printers' devils or illustrious astronomers among deserters from military bands. There have been, and are, distinguished generals who did not receive a military education—and the more deserved is their fame—but they constitute exceptions which merely serve to emphasize the general rule.

But Captain Pettit is not altogether opposed to theoretical instruction, for he says : " Theoretical instruction should be given, first in those things which can be fastened in the mind by practical application. The extra time can then be wisely devoted to military history, the art of war, tactical problems on the map, war games, staff duties, and essays on military topics assigned by the instructor." It so happens that all this *is* done at Fort Leavenworth, as Captain Pettit could easily have ascertained had he taken the trouble to do so. Theoretical instruction is first given in the different features of tactics, and a practical application of the theory is then made as far as possible *pari passu* with the lessons.

In speaking of the Fort Riley school, the essayist says : " It is also fortunate that its rational place in our system has steadily been kept in view, and that it has not been enticed into the mazes of text-book instruction, but has remained what it should be—a practical school." Captain Pettit evidently does not know that at Fort Riley the same books on tactics are studied that are used at Fort Leavenworth, and that theoretical instruction in the form of recitations is given. It is not so surprising that he should not know that the *practical* exercises at Fort Leavenworth last year were at least equal in number and scope to similar exercises at Fort Riley, for that fact does not seem to be generally known. It is nevertheless true, and might have been ascertained by the gold medalist had he done the Infantry and Cavalry School the justice of learning something about it before undertaking to criticise it.

In his comments upon the Military Academy, Captain Pettit says : " Very great care and wisdom must be used in determining the quantity and quality of the practical work, glibly talked about, but little understood by critics of the Academy. We must 'make haste slowly.' The able men who have the matter in charge are fully competent to arrange it for our best interests." It is a pity that he cannot place equal confidence in those who have the matter in charge at Fort Leavenworth, when he criticises that work so glibly. But as such confidence is evidently lacking, let us examine the matter and see how far the Infantry and Cavalry School deserves the essayist's suggestion that its work is not sufficiently practical. Let us first emphasize the fact that the school is not maintained for the purpose of giving instruction in ordinary drill which every subaltern can reasonably be expected to learn at his post. The practical instruction in tactics, is therefore, of a nature such as to make it a continuation and an enlargement of the instruction received by the student before entering the school. The nature of the practical exercises is thus described in the last annual report of the instructor in Military Art :

" The benefit derived from such exercises can hardly be overestimated, and those at

the Infantry and Cavalry Schools have a peculiar value, which is perhaps not generally recognized. At the time set apart for these exercises, the troops of the garrison, in numbers suitable to the nature of the exercise, are turned over to the instructor in Military Art, and are officered entirely from the class of students. As a result, a subaltern who, in the course of his regimental duty may never have had command of any body of troops larger than a platoon, finds himself in command of a regiment of infantry, a squadron of cavalry, or both, not merely to put them through a regulation close-order drill, but to march them, encamp them, prepare them for attack, make dispositions for defense, etc., and in every case to act promptly in accordance with varying conditions and the nature of the terrain. These exercises are well calculated to develop a young officer's self-reliance and confidence, more than any amount of ordinary garrison service. The peculiar advantage possessed by the Infantry and Cavalry School in this respect, lies in the fact that it is the only place where a large command and a full complement of young officers can be combined."

Captain Pettit's caution "to make haste slowly" in regard to the practical work of various kinds at the Military Academy should be extended, so far as practical exercises with troops are concerned, to all parts of the service. The value of these exercises is not in proportion to the amount of noise made or the volume of smoke and dust raised, but in proportion to the verisimilitude to actual warfare which they present. They must be in accordance with a well-digested scheme if they are not to degenerate into sham-battle nonsense positively pernicious in its effects. The number of practical exercises at Fort Leavenworth is constantly growing, being larger for each class than it was for the one immediately preceding. As the course is extended its proportionate rating is increased, but the practical exercises cannot be made to cover all but the winter months as Captain Pettit advises. The question of the necessary troops is evidently one that he has not considered. As the name implies, "exercises with troops" require troops, and even a great portion of the "exercises without troops" require horses, which have to be furnished by the cavalry. It so happens that the 20th Infantry and the squadron of the 6th Cavalry which constitute the garrison of Fort Leavenworth are not excused from anything that is required of any other troops in the army. They have their drills, their tactical exercises, their target practice, their thousand-and-one details of garrison instruction, and they cannot be constantly at the disposal of the school. It may be asked, Why not assign the students to the different companies and troops as supernumerary officers? To this it can be replied that the system of assigning student officers to the companies and troops of the garrison was thoroughly tried in the early days of the school and found wanting, and the interests of the post as well as of the school have been subserved by its discontinuance. It is a fact, of which Captain Pettit seems to be ignorant, that the Infantry and Cavalry School and the garrison of Fort Leavenworth are with the exception of having a common commanding officer and the garrison troops being available in the school "exercises with troops," as completely separate as though one were in Florida and the other in Alaska.

For theoretical work, Captain Pettit would divide the class into two sections; "one section to contain graduates of the Military Academy who have once been declared proficient in law, ordnance and gunnery, drawing, civil and military engineering; the other to contain officers who have had no theoretical instruction in those subjects. It is not possible to put both sections through the same course and do justice to both; either one will be unjustly retarded, or the other unduly advanced. To relieve the school from this difficulty, officers appointed from the ranks or from civil life should report one year sooner than the other members of the class to be taught the subjects mentioned above." The essayist here makes the mistake of supposing that the course in military engineering is the same as the one at the Military Academy, which it is not; also that there is at Fort Leavenworth a course in civil engineering, which there is not. In regard to dividing the class into two sections he is a decade behind the times. The class was formerly so divided—not into graduates and non-graduates of West Point, but according to educational attainments of the members,

some officers from civil life or the ranks being well qualified for taking any course laid out for graduates of the Military Academy. The real progress of the school dates from the time when this system was abandoned. The plan of having officers who were not possessed of a West Point education or its equivalent report six months earlier than the other members of the class was tried and abandoned, partly for want of quarters for the additional officers, but mainly because the results were not commensurate with the expense and trouble.

"During the second year," says Captain Pettit, "the practical work should be a continuation of the work of the first year, practical field engineering, combinations of the arms in minor tactics, infantry and cavalry, infantry and light artillery, cavalry and light artillery." With the exception of the work involving light artillery, all this is now done at the school and has been for several years. That artillery has not been included is no fault of the commandant or instructors.

In fact, Captain Pettit's knowledge of the Infantry and Cavalry School is so meagre that it scarcely deserves the poor compliment of being termed superficial. He says: "We have become so infatuated with the marking idea as to carry it into our post-graduate schools, and we have seen the sad spectacle of a war veteran competing, on a scale of three, with a 'youngster' just out of the Academy." Now, in point of fact, recitation marks are unknown at Fort Leavenworth, having been abandoned nearly two years ago. The essayist could have learned this from the last report of the Commandant of the Infantry and Cavalry School had he been so inclined. The only marks now given are in the practical work, in which each exercise is regarded as a part of the examination. Everything else is determined by the result of the examination.

Captain Pettit says in regard to the instructors: "All of our schools have suffered severely through the lack of good instructors. An order to instruct has been deemed all that was necessary to make an instructor; consequently the school has had to instruct both student and instructor. The text-book which could be closely watched became of necessity the boon companion of the instructor, and the system became dogmatic, uninteresting, and irksome to the last degree. In some cases the instructor brought less experience and but little more knowledge into the section room than some of his pupils; he could not possibly exert any beneficial influence over them, and necessarily retarded the progress of the school." This might seem to be intended to refer "to all of our schools," but as it appears under the caption of the Infantry and Cavalry School, it is evidently calculated to apply especially to that institution. If it were correct, it might be pardonable notwithstanding its severity; but it is both wildly incorrect and inexcusably unjust. In the early days of the school, the instructors were chosen from the garrison, and, whether satisfactory or the reverse, they represented the best personnel available. But all this has been changed. The instructors are no longer drawn from the post, but are appointed by the commanding general on the recommendation of the commandant of the school. That they are all perfect nobody claims, for a man may be an excellent officer and still be lacking in the pedagogic faculty; but it can be claimed for all that they are earnest and conscientious, and their qualifications can best be found in their records. Of the fifteen officers serving as instructors and assistant instructors twelve are graduates of West Point, and of this number six are graduates of the Infantry and Cavalry School selected for their special fitness as demonstrated in their careers as students. As to the instructors in infantry, cavalry, and hygiene, their character and qualifications need no defense from the careless remarks of the essayist. I say advisedly that the instructors and assistant instructors at Fort Leavenworth have for some years been selected with at least as great care as has been evinced in the selection of instructors at West Point. Even in the crudest days of the school no instructor in drawing ever perpetrated the topographical enormity of a sketch in which the streams violate the law of gravity and hold contours in contempt. I regret the same cannot be claimed for all the ex-instructors of drawing at the Military Academy.

The gold medalist says, "Practical work, zeal, simplicity and individuality should count three points as against one for knowledge of the book. Now the practical work alone is already assigned a value much greater than that given to the same amount of theoretical work, and all *possible* time is assigned to the former. As to "zeal, simplicity, and individuality," nobody at the school doubts the value of those qualities, and nobody desires to hold them in anything but the highest esteem, either positively or relatively; but how are they to be noted, reported upon, and recorded? Is it always possible to avoid error in "sizing up" a bustling sham or an earnest man whose zeal is concealed under an apparently apathetic manner? Is not apparent simplicity often a mask, and is individuality always evident? I have no hesitation in saying that if the attempt were made to form an estimate of the positive or relative merits of students based upon these valuable qualities, the greatest mistakes and the grossest injustice would be done. We might as well endeavor to form an estimate of relative merit based upon clearness of conscience or loftiness of soul on the part of the students, and imagine that hypocrisy would always be detected, and virtue ever be self-evident.

Perhaps the most amazing passage in the essay is the following: "A cavalry officer poor in horsemanship, slow in action, or lacking the physical and mental qualities that give energy and enthusiasm, should be recommended by the staff for transfer to the infantry." I can scarcely believe that this is not a typographical error. Is it possible that Captain Pettit entertains such a contemptuous opinion of his own arm? A man poor in horsemanship might, it is true, be a very poor cavalry officer and yet do excellent service in infantry; but if he be slow in action, or lacking the physical and mental qualities that give energy and enthusiasm, he will be utterly worthless in the infantry. Such officers did not lead Pickett's men up to the Union lines at Gettysburg, nor did men thus lacking make a lodgment in Lee's works at the "Bloody Angle." Such a transfer would, perhaps, have been proper in the Middle Ages, when the cavalry was an *élite* corps and the infantry a mere rabble, but it will not do in the present day. In his ideas in regard to the qualities requisite for officers of his own arm, Captain Pettit is fully six centuries behind the times.

"The sentiment of the service," says the essayist, "for the Leavenworth School will be more kind, details to it will be more eagerly sought, and the antagonistic feeling so common to students which makes good instruction impossible, may be overcome when it is put in rational accord with the object of its existence." I contend that the Infantry and Cavalry School is in rational accord with the object of its existence, and that this would have been evident to Captain Pettit had he taken the trouble to ascertain the true facts in regard to the institution. As to the sentiment in the service in regard to the Infantry and Cavalry School, I know that in the main it is both kind and appreciative, though the school is doubtless held in slight esteem by the three following classes: 1. Ultra-conservative relics of the past, who dislike it because it represents something new; 2. Men who, owing to their own mental deficiencies or moral shortcomings, have been sent away from the school without a diploma, and who shield their wounded vanity behind an assumed contempt for the institution which found them unworthy; 3. Thoughtless officers who, without making use of their own intellect or powers of observation, accept without reflection the assertions of the two former classes.

If Captain Pettit were gravely to recommend that our infantry be armed with breech-loading rifles, and were to base such superfluous advice upon the ground that during the Mexican War the American infantry had the muzzle-loading, flint-lock musket, the absurdity would differ in degree but not in kind from that of his remarks about the Infantry and Cavalry School.

In conclusion the essayist says: "The Leavenworth School is an important link in our chain of instruction. Its influence reaches deeply into two great arms of the service; in a few years its graduates will attain rank and command; how essential is it that its in-

structors shall grasp the spirit and methods of the new instruction, which places discipline, loyalty, zeal, determination to conquer and self-confidence first; daily training in all of the details and duties of one's own arm, second; and last, such accessories as may be considered necessary as preparation for high command, or for adding to the accomplishments and general usefulness of the officer." It has not occurred, perhaps, to the essayist that the officers on duty at the Infantry and Cavalry School have studied and carefully reflected upon the new methods of military instruction. They assume, however, that the student-officers are not school-boys, and that long before they are detailed for instruction at Fort Leavenworth their ideas of "loyalty, zeal, determination to conquer and self-confidence," have been carefully fixed. They assume also that the routine duties and details of the student's own arm have been correctly taught him in his own company and regiment; and they are firmly imbued with the idea that the true object of the school is to give instruction in those features of military education essential to line officers which cannot be taught with equal facility or equal thoroughness at ordinary posts.

First Lieut. Stephen M. Foote, 4th Artillery.

I am quite sure that Captain Pettit's ideas of proper military instruction will, in the main, be heartily endorsed by our officers. Not all change is progress by any means, but the changes suggested by Captain Pettit seem, for the most part, in the line of progress. Certainly his remarks about the relative amounts of time given to mathematics and the languages will strike a responsive chord in the breasts of most graduates of the Academy. But concerning the practical change that he suggests, has he not fallen into an error? He says we do not need more time for mathematics than is given at technical schools. Is that so, under present conditions? Is it not true that we do need more time—not in order to know more mathematics, but in order know as much? And here we come back to the same old subject, the difference between the entrance examinations at West Point and the technical schools. A good part of the first year is given up to teaching cadets what students at technical schools are required to know at entrance. With all the time now given to pure mathematics at the Academy cadets do not know any more of the subject than is essential to the proper pursuit of the sciences as taught in the rest of the course. I don't believe any one would wish to lower the standard of *thoroughness* which is the best and most distinctive attribute of a West Point education, or to take anything from the course in the sciences. So it is not easy to see how, until a change is made in the entrance examinations, any time can be taken from mathematics and given to languages.

With regard to the foreign languages, it seems to me a change for the better might be made within the time now at our disposal. And first let us consider for a moment why our officers should study foreign languages at all:

1. A large proportion of articles and military subjects are printed in French or German. While it is not necessary that officers in general should read these in the original, it is necessary that some should be able to do so and should translate the best of them for publication in our service journals.

2. While it is not necessary that officers in general should be able to speak two or three foreign languages, it is necessary that there should be some officers who could be called upon to visit foreign nations, foreign vessels in our harbors, foreign visitors to our country, and perhaps foreign enemies. These officers should be able to speak the foreign language, to understand and be understood. It will be objected that such service will be comparatively rare. True, but most important when it is required, especially in time of war. The time taken up in learning to speak a language is not taken away from the time given for learning to read it, but on the contrary, speaking a language is one of the aids to reading it understandingly. As a matter of fact it is impossible to read a modern language with a thorough understanding without an acquaintance with the living spoken language.

I, for one, should dislike to see Spanish dropped out of the course. I believe and

hope that the time is soon coming when we shall have much closer relations with Spanish America. Our foreign policy has been looking more and more that way for the past seven or eight years. Of course not much can be done with Spanish in the time now given to it, and the introduction of German as proposed would oust it altogether, and would probably result in an even division between French and German of the time now given to foreign languages, without a sufficient time being given to either.

Now, what I would suggest is this: Divide the class into three parts. Let one part study French, another German, another Spanish. Each cadet could then give all the time to one language that he now has for two, and with proper instructors, could get a fair working knowledge of it—I mean such a knowledge that he would be able to talk it, write it and understand it when spoken, as well as to read it. In dividing the class perhaps the divisions need not be equal. Perhaps cadets might be allowed to elect, to a certain extent at least, which language they would prefer. A half hour of the time now devoted to studying each lesson might be taken up in conversation in the section-room with the instructor. Topics of interest to cadets and pertaining to the lesson of the day would readily suggest themselves. Doubtless for a few years there would be some difficulty in securing qualified instructors among officers of the army, but that is a difficulty that could be overcome and would rapidly grow less. We should soon have plenty of officers able to do all that is suggested above as necessary, or at least desirable, in the use of foreign languages. Each graduate would be able to speak some one foreign language and would be able to read it better than cadets now learn to read French—and all without adding to the time now given to the subject.

First Lieut. Matthew F. Steele, 8th Cavalry.

Captain Pettit's prize essay is so full of good notions and excellent suggestions that one can hope it may be read and pondered by every officer in the service, but especially by those high in rank, authority or influence. Its main strength lies in its quality of being practical. It does not base its suggestions upon acts of congress, those *ignes fatui* of the hopeful; it takes the service as it finds it to-day. And it is optimistic; it does not spend itself in complaining of our present condition, but recommends ways of improvement for hereafter.

His recommendations for the conduct of our lyceums, our examinations for promotion and our service schools, are entirely novel, and I suppose original, and, if adopted, they would work immense improvement in these matters, and place them beyond the scoff of any officer, no matter how old and ignorant, nor how young and wise.

Among so many good things in an essay, one can find almost nothing to criticise and very little to oppose. He says (p. 14) "Infantry and cavalry officers have but little use for mathematics." Does he not ignore the fact that the principal use our country colleges make of the officers detailed as their professors of military science, is in the department of mathematics? Does he wish us to let all these college plums go to the artillery? And what part of the course in mathematics would he omit? Reformers are too given to telling us what we ought not have, without telling us what we ought to have.

I cannot quite see, either from the writer's argument or my own limited experience, why he attaches so little value to the study of Spanish, or why he should wish it replaced by German in the curriculum of the Military Academy. The dogma he lays down is "that the study of foreign languages can be approved only on the ground of utility." It must be remembered that Spanish is the language spoken by all the peoples of the American continent, except the Brazilians, south of the United States; and in view of the "reciprocity" and commerce our statesmen are promising from year to year, to say nothing of the possibilities of the Monroe Doctrine, it should seem that Spanish might be of some use to an American officer. "One can travel," writes Captain Pettit, "around the world quite comfortably without knowledge of any language but English." Perhaps so, in railway coaches

and steamers, but I suspect he never travelled "comfortably" on foot or horse-back into the interior of Mexico, if, indeed, along our own Mexican border, without some knowledge of Spanish. Did any one ever meet a "Greaser" that could tell him anything about a distance, a direction, a ford or anything else, except "No entiendo inglés"; "¿ Qui'n sabe?"; "No entiendo nada"; or "P'allá"?—and the last expression meant any distance from five feet to a hundred leagues, according to the intonation and the length of drawl.

The essayist takes the view that only a "reading knowledge" of a foreign language can be acquired in the time allotted to it at the Academy. Some eminent linguists, like Professor Rosenthal, have a quite contrary opinion, and many of us who have tried both incline to agree with Professor Rosenthal. Captain Pettit also thinks that is all the knowledge of a foreign language we need. In these days any German or French book worth translating into English is sure to find a translator; and for my part, I would sooner trust the expert to give me the fine shades of the French author's meaning,—the sense of his untranslatable idioms,—than depend upon my reading knowledge of the language. And through our service journals we may safely count upon getting the best professional literature of the French and the German magazines, because our editors will be supplied with translations of them by the experts of these languages found among us,—gentlemen who have spoken them from their infancy.

The author is certainly right in the importance he places upon the study of military history, and surely none should be more interesting, if more useful, than that of our own great war. Now, that the stupendous work of the Rebellion Records is about completed, it is to be hoped that the War Department will continue the good work, by detailing a board of competent officers to write a history of the war from these Records. Such a history would be the most perfect one ever written of any war, because there is such a quantity of data from every side, and there are officers in the service qualified for the work,—qualified by reason of their literary attainments, their patience and industry, and above all, their ability to be perfectly impartial in their treatment of the subject. As a readable history the scores of volumes of these Records are good for nothing; but as data, and for reference, they are invaluable. Every post-library should contain an unbroken set, but it seems absurd to encumber the quarters of every field officer with so much waste paper.

When in this connection the essayist says "we need not go back of Napoleon's time," one is reminded of the lectures of our dear old professor of engineering upon Lutzen (the first battle), and Blenheim, and our struggles with "Noizet's method." Had the professor lived and not retired from the chair, it is confidently believed he would have eventually gotten as far forward as Napoleon's time.

In detailing a plan of instruction for cavalry, Captain Pettit includes "guarding convoys" as of its "legitimate" duties,—a mistake that has often been made by commanders in war. Cavalry is such an expensive arm, and it has so many duties in war which cannot be done by other troops, that it should never be employed for any work that can be done as well, or better, by foot soldiers. Escorting convoys is emphatically of this kind, and it has no use for cavalry. The duties of troops with convoys is to guard them from foraging parties and raids of the enemy, and to keep them moving, mainly the latter, which, upon most American roads, means prying wagons out of mud holes, and hauling them across swollen streams with ropes. For all this work a horse is only an encumbrance. Attacking convoys is quite another matter; it is true cavalry work, and we should be thoroughly drilled in it in time of peace. Cavalry is an offensive, and not a defensive arm.

And the captain says "three mornings per week should be given to minor field exercises and two to close-order movements," during the drill season. This may do for infantry, but not for cavalry. There are too many letters in what he metaphors the caval-

ryman's "alphabet of war" (p. 38, par. 3), for him to devote so little of his time to the study, without the hazard of having his neck broken when he goes into his "words." In spite of the discouragement we have received from the prophets since before the days of Seidlitz, we cavalry folk still have a notion that we shall have work to do *on* the battlefield, and we must fit ourselves first for it. If drill is our "alphabet," and minor tactics our "words," and manœuvres our "sentences," the charge is our whole language, and it is what we want to teach our men and horses. But this means that the men must be perfect horsemen, and the horses must be perfectly trained; but the men must also be expert in the use of their arms,—the sabre, pistol and carbine,—and they must be thorough in their drill. If Captain Pettit has ever undertaken to train a horse for use in a troop, he must know how difficult that letter of our alphabet is to master. It takes just 180 hours of a skilled horseman's patient labor to train one horse properly. No, we cannot give up three days in each week of our short drill season to minor tactics; nor do we believe it necessary, though we admit the great importance of the instruction. No cavalry captain can contemplate his troop on the last day of the drill season, without wishing he had another month to drill it.

II.

"The Status of Medical Officers."*

By Major J. Van R. Hoff, Surg. Med. Dept.

IN a "comment" published in the last issue of the JOURNAL OF THE MILITARY SERVICE INSTITUTION [January, 1897] under the above caption, the writer thereof replies to a critique by Major Kilbourne, Surgeon, U. S. Army, published in the September issue of the JOURNAL. This critique was elicited by a criticism, presumably by the same writer, of a paper entitled "Outlines of the Sanitary Organization of some of the Great Armies of the World," published by me in the Proceedings of the Association of Military Surgeons, U. S., 1894 and 95.

The "comment" contains the following statement, * * * "the pamphlet which called forth a partial reply in the March number of this journal contained a distinct attack on the artillery arm of our service."

This statement is without foundation. In some hundred or more pages of printed matter not a single reference is made to "the artillery arm" of our service, and in the entire paper so far as my memory serves me the word artillery, except to enumerate the number of medical officers required therewith occurs but once, and that under the title "The Russian Army," in which a brief paragraph [Vol. V., p. 489, Proceedings Association Military Surgeons U. S., 1895] I gave what my investigation of the subject showed to be the status of the military surgeons of that army, a status which was until very recently, if it be not so now, identical with that of the Russian artillery officer.

The artillery of the United States Army cut no figure in the matter under consideration, and instead of an attempt being made by me to draw a parallel between its development and that of our own Medical Department, it was not even thought of, much less mentioned.

The object of this communication is accomplished in the foregoing, but in view of the further statements made by the writer of the "comment" I will venture to invite the attention of those interested in the subject to one or two facts regarding our Medical Department.

It goes without saying that the country demands an efficient military sanitary organization and that in order to this there must be a competent military medical personnel. To

* We respectfully invite the attention of those interested to p. 429, No. 80, March; p. 389, No. 83, September, 1896, and to p. 216, No. 85, Jan., 1897; also to the interesting articles by Surg.-Col. Hill-Climo, p. 347, No. 83, and p. 307, No. 84, November, 1896.—Ed.

secure this personnel the Medical Department opens wide its portals of admission to every reputable graduate of a reputable medical school, yet in spite of the extraordinary advantages of, and undue partiality shown to this branch of the service as alleged, the Medical Department has practically never been without vacancies, though every effort to fill it has been and is being made.

Is this the condition of any other branch of our service? Certainly there is no dearth, nor has there ever been any, of candidates for those offices which our critic has endeavored to show, are in rank, emolument and privileges below those offered by the Medical Department.

If it be true, as he says, that these are "days of large endowments and abundant educational facilities," why do not those who would follow the flag study a profession and come into the Medical Department with all its alleged advantages and where there is ample room, rather than wait hopelessly for a presumably less desirable commission in the line?

They never have, and they never will, the seeming advantages which are alleged to attach to the Medical Department disappear entirely in active service, under which condition its officers get a far larger proportion of hard knocks and much less material advancement than their comrades of the line.

We of the Medical Department ask nothing of the legislators except to be permitted to perfect our organization, to perform our current duties, and to prepare for the war we must expect.

We do not seek to perform the duty or exercise the function of the line officer. There is enough for him and us to do each in his own sphere. We did ask, in the interest of efficiency, to be placed upon the same military foundation with other staff officers and there the law of 1892 has placed us.*

Finally, the Medical Department needs no defense. The history of that department is written in the history of every war, and the record of its officers is found upon the monuments erected to the memory of those who died gloriously in battle.

Vancouver Barracks, Wash., January 18, 1897.

The Status of Medical Officers: A Reply.

"This critique was elicited by a criticism of a paper entitled Outlines of the Sanitary Organizations, etc., published by me in the Proceedings of the Association of Military Surgeons, U. S., 1894-95," writes the above author, and in so writing is mistaken. We never saw the article in the proceedings mentioned, nor have we presumed to go out of our way to criticise an article appearing in another journal.

The circumstances of the case are as follows: Early in 1896 this officer brought us a pamphlet on the subject named, which had been reprinted from a Detroit medical journal, and requested that it might be noticed in the JOURNAL M. S. I. This pamphlet had been written for a purpose and with a purpose, and culminated in a claim, the realization of which would debase the military status of line officers and diminish their professional position and esteem relative to a class of officers who have already obtained very liberal advantages in other respects, and for a distinctly non-military reason. As the article had received rather wide circulation, and as the culminating claim was at variance with the regulations (sec. 18) and the orders of the Secretary of War (front page) we ventured to combat the ideas contained therein. But in so doing we wish it may be clearly understood that we have no animus against the medical officer *per se*. We have carefully refrained from any personality and from all individual allusion, except in reference to such facts as any one may cull from publicly distributed documents, like the Army Register.

*The act of 1892 on which this claim is based reads as follows:—"That medical officers of the army may be assigned by the Secretary of War to such duties as the interests of the service may demand."—This author claims that the above act abrogates section 18 A. R. (See articles of Geneva Convention regarding non-combatants.)—ED.

Our critic proceeds to deny as unfounded the allegation that he had made what we considered an attack upon the artillery arm of our service. And right here we must continue to differ from him.

Nine lines below the quotation derived from our comment in the January number (p. 216) occurs the following: "A reading of this portion of the article naturally *leads to the inference* that a similar development has taken place in our own service, * * * and herein lay the sophistry and *herein the attack.*" In other words we did not accuse the author of making a direct attack, but one by inference or suggestion, and we still believe the inference a just one.

The military status of the Russian artillery had no natural place in an article devoted to sanitary organization, and if an analysis of this status did not serve a certain purpose, why was stress laid on its supposedly unfavorable condition with reference to that of the other arms? Why was a comparison instituted between the artillery status and that of the medical element in an article which began with a claim of equality between these two as to military status in one service and culminated in a similar claim regarding our own army through the supposed abrogation of section 18, A. R. ? We claim that the mating of terms, medical and artillery, the association of ideas, the juxtaposition of fact and statement in an article culminating in such a way, fairly suggested the inference drawn. To our mind the author's position is like that of one, who, in order to illustrate a point of conversation, had drawn two lines sufficiently near each other and in the same direction, and should afterwards claim that the relative position of these two did not suggest parallelism.

Recent advices assure us that the Russian medical officer is a much respected official rather than an officer in a military sense, and has no right of command; while the general officers of artillery are (and have been) assigned to large commands, consisting of all arms, by the same means and on the same footing as those of infantry and cavalry.

And here we would close a discussion that has ceased to be enlightening, but for one remark of the author, who asks, "why do not those who would follow the flag *study a profession* and come into the medical department, etc.?" We have always labored under the impression that we had studied a profession, and the gist of our contention is that our profession should be treated with the same consideration and freedom from encroachment as that of the medical officer. No officers are so jealous of their professional prerogatives as those of the medical department, and we ask that they shall show to others some portion of that regard which they demand for themselves. As to entering the medical department, that is a matter of taste, and the query is pertinent, why, if this officer desired to command troops, he did not take his place fairly and squarely among officers of the line where the right of command honorably and legally belongs, instead of attempting to gain it in this indirect fashion? To enter the medical department and obtain a rate of promotion out of all relation to that of other branches of the service—given for a reason absolutely non-military—and from the vantage of a position, so gained, attempt to grasp the attribute of a profession not his own may seem to this officer a clever stroke, but the victims thereof can hardly be blamed for viewing the matter in a different light.

"We did ask in the interest of efficiency to be placed on the same military foundation, etc." Why? We have the support of no less an authority than Surgeon-Col. Hill-Climo to the assertion that this would have exactly the contrary effect by attracting officers away from things medical to others more showy but less professional in character, to the detriment of the former and without particular benefit to the latter. In plain terms then, is it not "Military Power," rather than increased efficiency, that this officer seeks? Holy Writ warrants the assertion, ye cannot serve two masters; for either ye will hate the one and love the other, or else ye will hold to the one and despise the other. Russia, Austria, Italy, Germany, France, and even England with her heterogeneous organization, have not discovered that medical efficiency can be increased by giving the officers of their sani-

tary elements command of line troops—and their medical departments, particularly those of Germany and France, are understood to be in excellent condition. Why is it that a certain class among our medical officers feel compelled to seek such drastic, far fetched and unusual means for the accomplishment of such a purpose?

"We do not seek to perform the duty or exercise the function of line officers." Why then seek the right to command them?

"There is enough for him and us to do each in his own sphere." Yea, yea, say we; and will this officer kindly apply the principle to the case in point? It is just this fact, coupled with the excessive rate of promotion granted to medical officers, that makes their claim of military domination over men older in years and in service and in every attribute that goes to make an officer, such a wrong to these others and so detrimental to the service.

Sum cuique, say we.

III.

"The Sioux Campaign of 1890-91."

IT is not my desire to prolong a fruitless controversy, and one which could not but provoke some bitterness of feeling if carried to the limit. Lieut. Hawthorne seems desirous of reaching, but perhaps does not appreciate; and it is only for the purpose of entering a mild protest against his most unwarranted assumption in the first criticism, and emphasized in the second comment, as to the sources of my information, and the care I had taken to discover the facts, and also to point out some further inconsistencies of his position, that I venture to task the patience of the readers of the JOURNAL again upon the subject of the Sioux campaign of 1890-91.

It is past my comprehension that Lieut. Hawthorne should commit himself to such a statement as found in his first paper, viz., that he had sought everywhere for the authority for a certain statement in my paper, whereas the statement in question was to be found in one of the most prominent reports on the subject. A little investigation upon his part will reveal to him equally good authority for all statements as to facts, and his criticisms really bear upon those authorities and not upon me.

For the benefit of those gentlemen from whom he has received, as he states, "complete support" of the statements in his first paper, and to relieve his mind of any further feeling of responsibility in the matter of checking me, and keeping me straight in my information, I will state that my sources of information are, in addition to the reports of the Indian Department, all the reports of officers in command of troops or detachments during the campaign which could be obtained, some of them confidential, and extracts from others which could not be obtained in full; numerous letters and personal statements from officers who were in the campaign, and among these officers two who assisted in burying the dead Indians at Wounded Knee, and another who remained at Pine Ridge during the entire disturbance, and also the one who constructed the map referred to; the agent at Rosebud, who had been there some years; together with a close observation of the condition of the Indians on this reservation for many months before the outbreak, and certain memoranda made during the campaign.

I thought I had quoted sufficiently from the most conspicuous of these sources to convince my critic that I had sought to get at the truth, but since he refuses to be convinced, and continues to talk of second-hand testimony and things "*wholly imaginative*," stating that "Reports of secretaries cannot teach eye-witnesses anything concerning the events of that day," the case seems hopeless. Needless to say, of course, that reports of secretaries are made up from the reports of eye-witnesses, and others in a position to know; but if Lieut. Hawthorne has more reliable and accurate information in his possession than has yet been given out I should be pleased to have it. So far he has given very little evidence of such possession. He is ready enough to deny, but ventures with great caution upon the affirmative ground. He does state, however, that "135 seem to be about the

probable number of Indians killed *on or near* the field," which is not very specific for one who is so ready to condemn, and who declines to accept information given in official reports. It would be interesting to know if being an eye-witness enabled Lieut. Hawthorne to judge of the number of Indians killed better than one who counted the dead bodies after the fight. I have before me now, from an officer who assisted in burying the dead Indians, the statement in writing that he himself counted 156 bodies *on* the field, 84 bucks and the remainder women and children. Presumably the Indians found others at a distance, or added those who escaped to die of their wounds. Be that as it may, the official report of the Indian Department is 185 killed, which is the authority for my original statement on this point, and that number I am inclined to accept as very nearly correct.

I should also like to know if Lieut. Hawthorne is aware of the fact that 14 of the 120 warriors had left the camp on the morning of the 29th before the fight, and if so why he omits to note it; also whether he counted either the soldiers or Indians personally, the only thing which could justify him in disputing an official record; or if he thinks his presence there enabled him to judge the original intentions of the Indians; or if being an eye-witness of a fight in which the Indian scouts did not take part, enabled him to judge better than the officer who was in command of them as to their probable value and efficiency in case they had been called upon; or finally if this advantage enabled him to give expert testimony upon the condition of the sentiment in the 7th Cavalry. Referring again to my alleged charge of savage cruelty displayed by this regiment, which Lieut. Hawthorne seems so amusingly eager to defend, I desire to quote the following from an article by Capt. E. S. Godfrey of that regiment on "Cavalry Fire Discipline," in the JOURNAL for September.

"Before the battle of Wounded Knee I had a letter from a distinguished officer of the army in which he said: 'I hope even yet to see the campaign settled without a fight. If there is a fight, however, there can be no question as to the result.' * * * As soon as the Indians crossed the ravine, perhaps two hundred yards distant, and attempted to escape on the Agency road, I gave the command 'commence firing.' I know the men did not aim deliberately and they were greatly excited. I don't believe they saw their sights. They fired rapidly but it seemed to me only a few seconds till there was not a living thing before us; warriors, squaws, children, ponies and dogs—for they were all mixed together—went down before that unaimed fire, and I don't think anything got nearer than a hundred yards." This expresses all I intended to convey, viz.; that they killed everything in sight; and they continued to do so to the end. It seemed unfortunate, but doubtless could not have been helped after the fight opened. At any rate I had no intention whatever of making such a charge as Lieut. Hawthorne discovered in my remarks, or even of criticising adversely the conduct of our troops under all the attendant circumstances.

Lieut. Hawthorne totally misapprehends my original statement in regard to taking, "to a certain extent, the Indians' side of the question." The "Indians' side" was not as against the army, either at Wounded Knee or elsewhere, but as against the general policy pursued toward them for many years past, often against the advice of men well qualified to judge of the Indians' needs, and of the best methods of controlling and developing them. I have lived in, or near the borders of, an Indian country for three-quarters of my life and I think I know something of their character, and of their trials along the road toward civilization and self-support.

Wounded Knee was simply an incidental feature of my original paper, but apparently the only one Lieut. Hawthorne thought worthy of his attention. He takes in his first criticism nine items, all upon this affair, and asserts that a story is "woven around them," which is absurd to the last degree.

Permit me to say in conclusion upon this subject, that if Lieut. Hawthorne objects to a little personality, which I did not initiate, and which I trust has not transgressed reasonable limits, let him think upon the Golden Rule.

Reviews and Exchanges.

The Battle of Chancellorsville.*

THE disaster which overtook the Eleventh Corps at Chancellorsville was so overwhelming that all blame for the loss of the battle has naturally been placed by many on that corps, and it has been discredited accordingly. The author of the volume under consideration, in the course of certain investigations into the actual condition of things which occurred on the eventful 2d of May, 1863, obtained so much unlooked-for information in extenuation of the conduct of the Eleventh Corps in the action that he determined to publish the results. The course of his inquiries extended over a period of five years, during which he paid three visits to the battle field, in company with officers of both armies who were actually engaged in the battle.

PERSONNEL OF THE ELEVENTH CORPS.

It is the generally accepted impression that the Eleventh Corps was exclusively composed of Germans, or foreigners, and at that time it was frequently designated as the foreign contingent of the Army of the Potomac. The author finds that about three-fifths of the corps were American citizens by birth, and that many others were naturalized citizens. The corps at Chancellorsville—about twelve thousand strong—consisted of twenty-seven regiments, eleven of which were new, while the remainder had been tested in several campaigns and were veterans. There were regiments from Connecticut, Massachusetts, New York, Pennsylvania, Ohio, Illinois and Wisconsin. Many of the enlisted men composing the foreign element had seen more or less service in foreign armies and were well instructed. Some of the regiments were ranked as high as any in the service, and, “in the review of the Army of the Potomac by President Lincoln, in April, 1863, the Eleventh Corps made a fine appearance, particularly the division commanded by General Schurz, which impressed the presidential party as the best drilled and the most soldierly of all the army that passed before them.” The following were all good regiments, Twenty-fifth, Fifty-fifth, Sixty-first, Seventy-third, Seventy-fifth, and Eighty-second Ohio, they were veteran regiments, nearly all American citizens. The Forty-first and Forty-fifth New York were veteran regiments, also the Seventy-third and Seventy-fifth Pennsylvania, and the Fifty-fourth New York. Of the new regiments the Seventeenth Connecticut and Thirty-third Massachusetts were reckoned as among the best of the New England troops. The Twenty-sixth Wisconsin won distinction in the fight, and was afterwards considered as one of the best regiments in the service. The One Hundred and Fifty-third Pennsylvania, the One Hundred and Thirty-fourth, One Hundred and Thirty-sixth, One Hundred and Fifty-fourth and One Hundred and Fifty-seventh New York were all well officered and were regarded as good troops (34 *et seq.*). Of the superior

* *The Battle of Chancellorsville.* The attack of Stonewall Jackson and his army upon the right flank of the Army of the Potomac at Chancellorsville, Virginia, on Saturday afternoon, May 2, 1863. By Augustus Choate Hamlin, formerly Lieutenant-Colonel and Medical Inspector, U. S. Army. Historian Eleventh Army Corps. Bangor, Maine. Published by the author, 1896.

officers of the corps, General Howard, who commanded it, had already established his reputation on many fields, nevertheless there was some feeling against him in the corps on account of personal traits (34). The first division was commanded by General Charles Devens, who was sent to the corps by Hooker to replace McLean; an unfortunate change, for the latter had fought Jackson in his two former flank movements, was thus aware of his manner of fighting, and had he remained Jackson might not have surprised the flank of Hooker's army. McLean was a veteran of long service, had commanded the division for some time and was familiar with it (35). The commander of the second division was General Von Steinwehr, a trained soldier, who had received a military education in Germany and had served in our army during the Mexican War (44).

Third division, General Carl Schurz, a strong man intellectually, not a trained soldier, but well versed in military matters (44).

The brigade commanders were, McLean, previously mentioned, a son of Justice McLean of Ohio, who had won his way up by hard fighting. Von Gilsa, a typical German soldier with the rank of major in the Schleswig-Holstein war, and who had served with great credit up to that time in the Civil War. Buschbeck, son of an officer and educated in the military schools of Germany; the records show that he was a man of high soldierly qualities, and was well thought of by Generals Sherman and Hooker. Barlow, a new comer in the corps and little known to its members, a martinet and a hard fighter. Schimmelfennig, an ex-officer of the Prussian army, well read in military science and of undaunted courage. He and Von Gilsa felt keenly the unjust imputation of Chancellorsville and chagrin hastened their death. Kryzanowski, a Polish exile, who entered the service when Sumter was attacked. The chief engineer of the corps, Major Hoffman, had received his military education in Prussia, had served with distinction in Denmark, the Crimea and Africa, and was a sterling soldier.

Some of the colonels and subordinate officers of the corps were fine American officers, many of them were veterans with good records, and a few had served with distinction in other wars. The personnel of the corps throughout was certainly very good, and the corps did not deserve the stigma which had been cast upon it. A scape-goat was necessary and the corps was made one (34 *et seq.*).

POSITION OF THE ELEVENTH CORPS.

The Eleventh Corps was on the extreme right of the army, and, facing south, covered a distance of a little over a mile. Hooker's position was so strong that the Confederate engineers reported adversely to any attack upon it from the eastward (11). Jackson was therefore directed to make a flank movement to the right and rear of the Union army. For this purpose he took fully one-half of Lee's army, seventy regiments, or about thirty thousand infantry, besides artillery and four regiments of cavalry. At daybreak Jackson started, his columns filling all the roads and paths leading west through the forest in front of the right flank of the Union army. His march was in plain sight for several hours of the Third and Eleventh Corps, and within easy artillery range. Birney reported the movement to Sickles, and the latter reported it to Hooker (13). With Jackson's well-known reputation for flank attacks it is very singular that his movement should have impressed the high ranking officers of the Union army with the idea that Lee's whole army was in retreat. Was the fact that Hooker had relinquished the offensive and had taken a strong defensive position any reason for thinking that Lee was retreating? Since the position was strong, was that not a good reason for Hooker to think that Lee would try to turn it? And since the left flank was particularly strong, should he not have had constantly in mind the danger of an attack on his right? "Hooker's orders all indicate a determined resolution to remain on the defensive, and his words of caution to Sickles when

he went down to the Furnace with Birney's Division were not to bring on a battle." When, in consequence of some artillery fire, Jackson's march was deflected to the south, out of sight of the Union scouts, Hooker was satisfied that Lee was retreating and no successful effort was made to fix the direction of march of the disappearing troops. At 5 p. m. Jackson had his force in position, rested and ready to attack.

"It seems incredible that an army of thirty thousand men could be moved directly past the front of a much larger force, and arrange itself in three lines of battle, within half a mile of the force to be attacked!"

WARNINGS OF DANGER UNHEEDED.

Lieutenant-Colonel Carmichael, One Hundred and Fifty-seventh New York, in charge of a portion of the picket line, reported at headquarters early Saturday morning that during the night he had heard trains moving past his front, "and was told for his pains that new troops were easily frightened." Colonel McLean reported to General Devens that officers had seen the enemy's troops moving toward their flank at 10 A. M.; the latter reported the fact to General Howard. Colonel Friend, division officer of the day, reported to General Devens that a large force of Confederates was passing to his rear, but his report was discredited. Upon making the same report at corps headquarters he was severely rebuked (55). Early in the afternoon, Captain Dilger, Battery I, First Ohio, while reconnoitring, rode into the enemy's forces north of the Luckett farm and only a little over a mile from Von Gilsa's position on the extreme right flank of the corps. He was pursued by a force of cavalry, but escaped and reported his adventure at Hooker's headquarters: he was laughed at for his pains. Upon reporting the same facts at corps headquarters, "his remarks were received without the slightest confidence." General Devens was repeatedly warned of the enemy's presence; Colonel Lee of the Fifty-fifth Ohio, Colonel Richardson of the Twenty-fifth Ohio, made reports to this effect and urged that dispositions be made to meet attacks on the flanks, but they were not believed. The author gives other instances of warnings and repeated warnings to superior officers, all of which were equally disregarded (55 *et seq.*).

In such a close country as that surrounding the position of the Eleventh Corps—heavily wooded on all sides with the exception of small farm clearings here and there—and in view of the various reports which had been made in regard to the enemy's presence, it would seem that a strong reconnaissance by infantry, in the absence of cavalry, should have been ordered by the corps commander along the Pike and Plank roads. Even a single company or regiment would have settled the question in half an hour. Fatal fatuity to neglect these repeated warnings! It was certainly unfortunate, in view of later events, that the only cavalry with the Army of the Potomac at this juncture was one small brigade of three regiments. Even this small force was divided, a regiment being assigned for duty to each of three different corps, a course which must necessarily have proved fatal as far as definitely locating the enemy was concerned, for a small force of infantry in that close country would have been able to brush aside a regiment of cavalry. There might be another story to tell had the Cavalry Corps remained with the army instead of being sent under Stoneman to cut Lee's communications, an operation which had no effect upon the movements of the Army of Northern Virginia.

That General Hooker was impressed by the word from Sickles that there was a movement of troops along his front and towards his flank is evidenced by the order issued to Howard and Slocum. Hooker had inspected the line of the Eleventh Corps, and, on receiving the word from Sickles, issued his 9.30 A. M. order. He said: " * * * The disposition you have made of your corps has been with a view to a front attack by the enemy. If

he should throw himself upon your flank, he wishes you to examine the ground and determine upon the positions you will take in that event, in order that you may be prepared for him in whatever direction he advances. He suggests that you have heavy reserves well in hand to meet this contingency. The right of your line does not appear to be strong enough. * * * *We have good reason to suppose that the enemy is moving to our right.** Please advance your pickets for purposes of observation as far as may be safe, in order to obtain timely information of their approach." Although this order was discussed by Howard and Schurz, and although the latter argued in favor of a change in the position of the troops to better meet a flank attack, and indeed suggested specific changes, no change of any moment was made (21). And although all subsequent information should have tended to create further suspicion in the minds of both the army and corps commanders of a formidable flank attack, still the former did not see that his orders had been obeyed and even permitted the corps reserve to be withdrawn; and the latter was so little impressed that he went in person as far as below the Furnace, accompanying Barlow's brigade when it was sent to join Sickles' movement. Barlow's brigade, the largest in the corps, about three thousand men, was the corps reserve, and was withdrawn from its position by Captain Moore, of Hooker's staff, between 4 and 5 P. M., at the very moment when over fifteen thousand of the enemy's troops were resting on their arms within a mile of the right flank of the corps. When Howard returned the storm had burst (54). The position of the Eleventh Corps was still further jeopardized by

SICKLES' FATAL RECONNAISSANCE.

General Sickles' ever present desire to be in touch with the enemy was on two occasions a matter of grave concern to the Army of the Potomac. If his desire to meet the enemy had been emulated by others in high command the history of the war might be somewhat abridged. But there are occasions when discretion is the better part of valor. While Jackson's troops were gradually disappearing in the forests, Hooker, convinced that Lee was retreating and his army demoralized, was permitting Sickles to gradually advance troops from his centre. Up to 5 P. M., the time when Jackson was ready to develop his attack, some twenty thousand men had been withdrawn from the general line and pushed forward to the Welford Furnace and beyond, even to the unfinished railroad cut, some three miles from the now threatened Eleventh Corps. "At this hour, past five P. M., Hooker, Sickles, Warren, and most of the other general officers, excepting perhaps Slocum, believed that the rebels were in full retreat, and that the glorious opportunity of capturing a large part of their force, with cannon and trains, was rapidly passing away. So completely did this idea take possession of their understanding, that they did not entertain or discuss even a suspicion that Jackson, instead of seeking flight, was marching for their unguarded rear. Sickles, away down in the woods below the Furnace, was so saturated with this notion of Lee's flight that he refused to listen to the staff officer who brought him the information that the Eleventh Corps, less than two miles in his rear, had been fighting for more than half an hour and was being overpowered by greatly superior forces. Not until the second officer arrived, bringing details of danger and disaster, could he realize the absurdity of his expedition and the extreme peril in which his troops were then placed. A more ridiculous and stupid surprise did not occur in the history of the Civil War. It seems incredible that, when word came from Sickles to Hooker that he was among the rebel trains, Jackson was actually three miles almost directly in his rear, and was about to hurl the most of his thirty thousand men upon the feeble obstacles in his front, comprising only the forlorn Eleventh Corps, then deprived of its reserve brigade. It is still more incredible that, when Birney was preparing to bivouac with his powerful

* Italics are mine.—E.

division below the Welford house, two miles below the Plank road, wondering what had become of the enemy, he was not aware that Jackson had been pulverizing the deserted and depleted Eleventh Corps of nine thousand men for more than an hour. * * * Pleasanton, with his cavalry, instead of scouting on the exposed right flank, and developing the concealed enemy, clung to the shadow of headquarters, where he inundated Hooker with his vain advice." Sickles' movement was fatal. Just about the time that thirty thousand men were about to fall upon the right flank of the nine thousand at that time holding the lines of the Eleventh Corps, the corps was isolated and fully a mile separated it from any troops—Twelfth Corps—which could come to assist it, or which could form a support upon which it could rally. General Hooker permitted this movement of troops from his centre in spite of the fact that it followed his 9.30 A. M. order, and although he knew that Stonewall Jackson was with Lee's army and that he had a method all his own of making flank attacks and of making of them a success. That the danger of such an attack should have dominated Hooker's mind to the extent of excluding the idea of any other possible move by the Army of Northern Virginia is forcibly shown by his testimony before the Joint Committee on the Conduct of the War, on March 11, 1865, as follows: "At that time it had been reported to me that the enemy had been making a flank movement to our right, and I gave directions * * * to hold the Eleventh and Twelfth Corps in readiness to receive an attack in that direction, at the same time suggesting that heavy reserves be held well in hand. * * * These movements of the enemy it should be remembered, were made in broad daylight, and were observed from the headquarters of the first division of the Eleventh Corps."

JACKSON STRIKES THE ELEVENTH CORPS.

It is purposed to follow briefly the progress of the flank attack, with a view to show the amount of resistance made by the Eleventh Corps, and which the author claims should aid in removing the stigma attaching to it.

At 5.15 P. M., all his troops being in position, the signal was given for Jackson's men to advance. The Confederate line extended fully a mile on either side of the Pike, along which the Eleventh Corps was posted. Consequently the successive regiments as they changed front to meet the advancing Confederates were first assailed in front, and then shortly after on both flanks, and forced back. There was resistance made to the advance, but under the circumstances the Confederates could not be long held in check, and the Federals were driven back. Under these conditions there was necessarily much confusion, but the retreat was not a disorderly rout as has been charged. Some of the men as they were driven back joined successive regiments as they formed up to meet the advancing attack, while others continued their flight, refusing to halt, as far as the Chancellor house, two miles distant. Portions of the following regiments made resistance until they had no further showing, or until it became a question of flight or annihilation; Forty-first, Forty-fifth, Fifty-fourth New York, and One Hundred and Fifty-third Pennsylvania. The Seventy-fifth Ohio breasted the storm for nearly ten minutes, or until utterly wrecked. A brave stand was also made by the Twenty-fifth Ohio, reinforced by some of the fugitives; when they broke the disorder was very great and the remnants of Devens' division disappeared.

The second attempt at resistance was made by Schurz's division, assisted by remnants of Devens' division. "General Schurz was impressed early in the day with the weakness of his position in case the attack was made from the westward." He wished to form his line from the Plank road north along Hunting Run, but was refused permission to do so. He did, however, of his own volition, cause the Twenty-sixth Wisconsin and Fifty-eighth New York to form front facing the west and placed the Eighty-second Illinois in support. Thus

was formed the nucleus for a new line, the wisdom of which became apparent when the attack was developed. This line was attacked with great energy, resisted obstinately for some twenty minutes, but eventually was forced back, being flanked.

In the third and last attempt to hold Jackson at bay only four thousand or five thousand of the Eleventh Corps took part. The rest of the corps had retreated, or were left on the field, or were with Barlow's brigade below the Furnace. Although fighting about an hour no reinforcements had reached the corps.

The remnants of the corps took shelter in the shallow rifle pits which had been dug in the morning by Barlow's brigade. It was about this time, 6.30 P. M., that Hooker first heard of the attack on the Eleventh Corps, the fugitives bringing him the news. Here again the front attacks of the enemy were repulsed, but after both flanks were turned the men withdrew slowly, taking shelter in the woods in the rear.

In both these stands and during the retreat from them, Dilger, at first with his battery and finally with one gun, rendered marked services.

With the forcing of this line the advance of the enemy was for a time suspended, for there was no pressing forward in pursuit. The remnants of the Eleventh Corps next appear as a part of the general line of defense around Fairview (64 *et seq.*).

The foregoing brief statement of the resistance offered by the Eleventh Corps during Jackson's flank attack is corroborated by the reports of the corps, division, brigade and subordinate commanders, and by those of the Confederate officers opposed to them.

In view of these facts is there justification for Warren's statement in his official report? "The Eleventh Corps infantry made no stand at all behind its breastworks, but ran away while yet the enemy's bullets scarcely reached them." Is Hooker just in his testimony before the Joint Committee on the Conduct of the War?

"The Eleventh Corps had been completely surprised and disgracefully routed. * * * No disposition had been made to receive an attack, and there were no pickets on the alert to advise of the approach of an enemy." The blame for the defeat is then laid on Howard, although the Commanding General himself must have authorized the withdrawal of his reserves, had refused to be convinced that Jackson was menacing his right flank, and had persistently spread the report from his headquarters that Lee was retreating. It was the duty of the high-ranking officers to ascertain the correct facts. Is there not an endeavor, but partly concealed, to excuse a failure to develop the true meaning of that movement of troops by placing all the blame for Jackson's success upon the unfortunate Eleventh Corps, the object of the attack? Can any one say that any body of troops of equal number, under similar circumstances, would not have been beaten?

By 7 P. M. the Eleventh Corps had been driven off the field, the bulk of the Third Corps and a part of the Twelfth were still in the vicinity of the Furnace, why then were not the results of Jackson's attack more complete? The author gives several reasons. First, Colquitt's error. "Seventeen regiments of the right wing * * * had been detained by the fatuity of General Colquitt, who commanded the right brigade of Rodes' first line of battle," because he thought he was being flanked, "and when they did arrive on the field of battle, the wrecks of the First and Third Divisions of the Eleventh Corps had escaped from almost certain and complete destruction or capture." Second, the delay after the remnants of the Eleventh Corps had been driven from their third position. "Jackson ordered his men to push forward, but Colston and Rodes, who commanded the two front lines of battle, urged Jackson to halt, and represented to him that their men were too much exhausted by the long march of fifteen miles, the lack of food for the entire day, the difficulty of marching through the dense thickets, and the attack on the Eleventh Corps, to advance further, and they advised their chief to call a halt and reform. General Jackson called a halt, but with great reluctance, for he believed, and with reason, too, that one more effort would

place his men in command of the open field in the rear of the Chancellor house and also of the only road by which a large part of the Third and Twelfth Corps could escape." Third. The wounding of Jackson. This event occurred about 9.15 P. M., and Stuart, who succeeded him, did not arrive until midnight, "and in the meantime Jackson's victorious corps was adrift. * * * For more than two hours no officer felt at liberty to take any decisive action, and the golden opportunity rapidly passed away. * * * The wounding of Jackson was a most fortunate circumstance for the Army of the Potomac at this moment, and it was certainly fraught with bitter disappointment to the Confederate cause. At nine o'clock the capture or destruction of a large part of Hooker's army seemed inevitable. Thirty minutes later all was changed by Jackson's carelessness or rashness. There was at this time great uncertainty and a feeling akin to panic prevailing among the Union forces around Chancellorsville, and it may be said truthfully that there was considerable of this feeling among the rebels themselves, though flushed with victory."

The peculiar atmospheric conditions prevailing at the time of Jackson's attack are clearly explained by the author. It seems these conditions were such that Hooker, at the Chancellor house, about three miles from his extreme right flank, heard no sound of the battle and learned of the attack through fugitives from the field. At the same time, "McLaws * * * was waiting to hear sounds of Jackson's guns before attacking Hancock with vigor. Posey and Wright, with their brigades concealed in the woods on Birney's flank, were listening for the same signal, but failed to hear definite sounds. Sickles also, at the Welford Furnace, did not hear a sound of the fight which wrecked the Eleventh Corps."

It remains an open question which side was favored by this condition of affairs.

In regard to the responsibility for the disaster to the Eleventh Corps, the author says: "The investigation clearly proves that the disastrous results of the battle at Chancellorsville cannot be justly ascribed to the want of vigilance and soldierly conduct on the part of the rank and file of the Eleventh Corps. * * * There is certainly reason to believe that there was a deliberate conspiracy to shift the errors of the battle upon the Eleventh Corps, and the statement of Hooker, Sickles, Warren and Birney furnish sufficient proof of the intent. Those who were the most implicated in the wild-goose chase below the Furnace, and who are the authors of the misfortunes of the army, are the foulest in abuse and loudest in falsehood." The fault was one of position, not of the troops. The book is a valuable addition to the literature of the war, and the questions raised are well worth searching investigation. Justice requires this.

The Addenda contains much matter of great interest, also nine very fine maps showing the positions of the troops in detail at 8 A. M. and from 5 to 12 P. M.

FRANK H. EDMUNDS,
Captain First Infantry.

Annual Report.

The Military Service Institution of the U. S.

Governor's Island, N. Y.

JANUARY 1, 1897.

To the Members of the Military Service Institution of the United States.

GENTLEMEN:—I have the honor, on behalf of the Executive Council, to submit the following report of the operations of the Institution during the year 1896.

The Treasurer's report shows the affairs of the Institution to be in an excellent condition, the receipts for the year from all sources exhibit a gratifying increase over those of the previous year, the sum total forming the largest annual income of the Institution since its formation.

The excellent essay of Major Geo. S. Wilson, presented in the May number of the JOURNAL, forms the first of the series of prize essays of the Infantry Society, published by the Military Service Institution in accordance with the arrangement noted in the last annual report.

This interesting article, entitled "The Army: Its Employment during time of peace, and the necessity for its increase," is admirably written and evinces a clear appreciation of the importance and bearing of the subject, and should aid materially in impressing upon the minds of our people the great necessity which exists for placing our small army in a position as to organization and numbers, which will better accord with modern requirements and the dignity of our nation.

The Gold Medal of the Institution for 1896 was awarded to Captain James S. Pettit, 1st U. S. Infantry, for the best essay upon "The Proper Military Instruction for our Officers; The Method to be Employed, its Scope and full Development."

The series of Historical Sketches, the announcement of whose approaching publication was made in the report for 1895, have since made their appearance in handsome form, and the gratifying demand for the volume, I am glad to hear, assures the success of the venture in a manner alike creditable to its projectors and the publishers, who have lent the aid of their facilities for its production.

Very respectfully,

J. M. SCHOFIELD,

Lieut.-General U. S. Army.

Publisher's Department.

THE Cycle Show of 1897 in New York.—A general inspection of the exhibits of the leading houses at the big cycle show in Grand Central Palace reveals the fact that the show is rich in novelties relating to minor details. The tendency has been to improve on old ideas, and it is obvious that much success has attended the efforts of the thinkers.

In frame designs few changes are to be observed over the familiar models of last year. It is evident in this connection, therefore, that a fixity of design has been reached and that nothing radically new in this direction may be expected, at least for some time to come.

As will be noticed in the descriptions which follow, the most important changes are to be found in the internal mechanism. These are worthy the attention of every rider who owes it to himself to know thoroughly every vital part of his metal steed.

The beautiful finish of the new models is another feature of the show that is worthy of special mention. Some remarkably fine effects have been secured in colors, and the fashions of the makers in this respect will be very likely favorably received by their customers.

* * *

The Tribune Bicycles.—Ten Tribune bicycles, including single wheels, tandems, and a triplet, are shown by the Black Manufacturing Company, in Spaces Nos. 15, 16, 41, and 42. The models are finished in black, royal blue, maroon, and robin's-egg blue, and each color makes a very attractive finish. The special features of the Tribune are the cyclodial sprockets, the crank-fastening device, seat-post, converging bars, oiling device, pedals and the method of attaching the sprocket to the shaft.

* * *

The Hartford Tires.—The Hartford single-tube tires, which enjoy a wide popularity, are exhibited in Spaces Nos. 204 to 206. It is claimed that these tires are the original single tubes, and the Hartford Rubber Works Company, the maker, has steadily adhered to its method of construction in the face of what was almost universal opposition during the early years of the manufacture of single tubes. The "quick-sealing" cement made by this company is a simple and practical solution of that bane to the rider, a puncture. Injected into the tire, it forms a plastic plug which effectually mends the tire, and is so easily applied that the veriest amateur can appreciate it. With this solution a tire can be properly mended in two minutes.

* * *

Sterling Cycle Works.—The Sterling Cycle Works, showing a large number of models in Spaces Nos. 77, 78, 79, and Nos. 98, 99, and 100, regard as their special feat-

ure a corrugated hub. This allows a large number of spokes in each wheel. No single item of expense has been spared in this year's models, the best having been secured in every instance, regardless of cost. The new racer is a distinct model, constructed specially for track purposes. It has a three-inch drop to hanger, a shorter wheel base, a lower frame, as well as other features that will appeal to men of speed.

* * *

The Spalding Display.—As usual, the display made by A. G. Spalding & Brother is very complete and among the most attractive in the exhibition. After making a careful study of the requirements of riders in general, and particularly of that class who ride solely for pleasure and consider comfort as the most essential feature of the bicycle, this house has prepared to meet the demand of this class of trade with the Spalding hygienic frame. This contains many features which are original with the Spaldings, and which are not to be found in the machines of other makers operating under the patents of the Hygienic Wheel Company. The structure has been simplified and improved wherever needed, particularly in the rocker joint at the crown hanger, which will commend itself at first sight. It is unusually strong, and is also adjustable for wear, and there is a lack of the usual complication to be found in most wheels of this description.

* * *

Military Folding Bicycles.—A decided novelty in the show is the display of military folding bicycles, made by the Dwyer Folding Bicycle Company of Danbury, Conn., one design is similar to that adopted by the French army, and the other is like that in use in the Mexican army. A ladies folding bicycle is also shown, and this will be sure to attract much attention from the women.

* * *

Remington Special Models.—Sixteen fine models comprise the exhibit made by the Remington Arms Company. The special features to which the company draws attention are the new and scientific construction of bottom bracket and sprockets. By this method of constructing these parts, the rider is enabled, by detaching the left crank (which is the work of but a few seconds) and releasing a nut at the lower side of the bracket, at once to remove the axle and the entire interior, leaving nothing but the bracket forging. The axle used is of the single-piece pattern, and by the method, as explained, the same result is obtained as that secured by using the two-piece style. Both front and rear sprockets are of a cycloidal cut, with flange to carry the chain. This construction of the sprockets reduces the friction considerably, and also prevents the vibration which is very noticeable in a chain running over an ordinary sprocket.

* * *

Columbias and Hartfords.—The exhibit of Columbia and Hartford bicycles this year is of an unusual high order of merit. It is one of the most complete in the entire show, comprising, as it does, almost everything that is used in these famous wheels. The refinements of detail and construction are easily noticeable, the assembled wheel presenting a very finished appearance. The accuracy and skill of Columbia mechanical methods are proverbial. Columbia methods are not the methods by which cheap bicycles can be made. They are part of the Columbia system by which a uniform quality is maintained.

The result is that Columbia bearings and frames give great satisfaction. This year's Hartford bicycles, which form the cheaper line of the Pope Manufacturing Company's product, are noteworthy in thoroughness of construction, excellence of material and advanced ideas in design and equipment.

* * *

Designs of the Overman Company.—Some particularly fine designs in wheels are shown in the line exhibited by the famous Overman Wheel Company. Many improvements are to be noted, among them being the enlarged tubes in upper and lower rear forks and upper forward tube; also in a new saddle-post connection. The company assert, and declare they will demonstrate, that no other bicycle in the world can show such a record for quality of material and workmanship as the Victor. Crucible steel drop-forged connections and well tempered parts are the keynotes of Victor quality and construction. In the Victor bicycle, the nickel, paint, and enamel cover no flaws, conceal no castings and case-hardened cones. From tires to saddle, from rims to post, from cranks to bar, from balls to grips, the structure is made in one factory. The ladies' wheels turned out by this old house will appeal very strongly to the fair sex. They are particularly attractive, and, of course, in workmanship and appearance they are strictly high grade.

* * *

Wolff-American Wheels.—Beauty of outline and rigidity of frame are two strong points in the Wolff-American wheels for 1897. The frames are built with peached tubes, which gives the rider a proper position without the use of the forward seat post. Instead of forgings or stampings, tubing is used for all connections, the frame being joined in a peculiar manner which renders a broken frame an impossibility. The fork sides are not reinforced, but are made of heavy tubing, with the gauge swaged between from the crown to the tip. This prevents the crystallization made possible by the ending of the reinforcement, and the vibratory springs are diminished gradually without shock. A greatly simplified method for attaching the cranks to the axle is employed, and to remove them is only a matter of a few minutes. The axle has tapered ends, with two parallel and two concentric sides, which fit snugly into the aperture of the crank. The bearing adjustments are devoid of complications, and to manipulate them it is only necessary to loosen the outside nut on the lower side of the wheel. The sprockets are detachable both front and rear. They are of an ornamental design and accurately cut from the finest of steel. The Duplex, which attracted so much attention last year, contains many new features.

* * *

The Grand is Popular. William G. Leland, its Proprietor, is Warmly Congratulated.—The Grand Hotel, at Broadway and Thirty-first Street, is rapidly becoming known as one of the most thoroughly equipped, as well as one of the most popular in the metropolis, and its proprietor receives frequent and warm congratulations upon his marked success.

When Mr. William G. Leland came into possession of the house two years ago he had much of it remodelled, adding about forty rooms to its former capacity. Notwithstanding the increased capacity of the house, it is a frequent occurrence lately that parties arriving late in the evening cannot find accommodations.

The Grand Hotel has its own electric, refrigerating and ice plants, modern plumbing, hot and cold water in every room, and is, in all respects, "up to date." No hotel is more desirably located for family and transient guests.

The Grand still continues to be, as in the past, the favorite stopping place for Army and Navy officers and their families while sojourning in New York.

* * *

The Shirt Question.—The shirt question is an important one to every well dressed man. Just how important it is he never fully realizes till he has the opportunity of comparing a really satisfactory shirt with one not quite so good.

Satisfaction is a good thing and worth going far for. Shirt satisfaction is only secured after somebody has done a lot of thinking and figuring.

The man who makes the right sort of shirts is the one who looks at the making from the wearer's standpoint. He makes a shirt to wear—not to look nice in the box or to sell at a certain price. He considers that a man likes to stretch his arms occasionally without restraint or rips. He knows that a shirt ought to fit snugly in the neck and bosom, and no place else. Fit in a shirt means the proper snugness and looseness. You can't get these things in every shirt shop you come to. And that's just the trouble about most shirt purchases. They are made "most any place."

There's an impression in many minds that "shirts are shirts." It's a mistake. Some shirts are "Keep's Shirts." And thereby hangs a tale.

When a man once wears Keep's shirts he is seldom satisfied with anything else. The uniform satisfaction afforded to wearers of Keep's shirts is somewhat remarkable, considering the fallibility of all human effort. Ninety-nine men's perfection might not please the hundredth man. Satisfaction is getting what you want. That is what the Keep Mfg. Company of New York give their customers—what they want. That is what they want them to have—that, and nothing else.

If a mistake should ever occur, they would much rather have it pointed out than to have their customer nurse his dissatisfaction into antipathy. They stand always ready to remedy mistakes with perfect shirts, or with money.

Their custom shirt factory is said to be the largest in the United States. It is operated with such perfect system and economy, by such skillful labor, that they are able to supply the very highest grade of shirts at prices most moderate. They have been making shirts for the last thirty-two years, and what they don't know about shirt making isn't worth knowing. Their line of fancy shirtings this season is larger and better than ever before. They mail samples with full particulars upon request. A visit to their establishment at 809 and 811 Broadway between 11th and 12th Streets, will fully repay anyone for the trouble. Even if you are only curious, they will be glad to show you their goods and methods.

* * *

The Fountaingrove Vineyard Co.—The wines of this company have found favor with the officers of the service, there is no doubt about this, for the orders from post exchanges and from individual officers of the service prove this fact. It seems, therefore, to be unnecessary to give more than a slight reference regarding them.

As the Department of Burgundy—so prolific in vineyards—possesses its two or three châteaux that stand out illustrious and distinct in the superiority and excellence of their products, so do the Fountaingrove Vineyards hold a unique place of honor and distinction amongst the wine producing districts of California.

It is now demonstrated by the corroboration of scientific analysis together with gustatory and hygienic evidence that these mountain wines from the Fountaingrove estate—well ripened and matured—contain every essential quality which characterizes the high grade

vintages of France and Germany and possess the merits which distinguish the *grand vins* of those countries.

By the various Post Exchanges and Officers' Clubs these wines have been received with great favor. The attention of officers is hereby called to the fact that in Departments where Post Exchanges are not handling wines at all, this company can easily supply them direct with these choice beverages.

Samples furnished upon application to the Fountaingrove Vineyard Co., 58 Vesey St., New York City.

* * *

Parke, Davis & Co.—This well-known firm, manufacturers of drugs and chemicals at Detroit, Michigan, patronized by the service for years, have secured the services of Dr. A. E. Dickinson as manager of the Department of Digestive Ferments. Dr. Dickinson, well and favorably known among the officers of the Army and National Guard, has recently resigned the position of manager of the Cudahay Pharmaceutical Co., which position he has held during the past five years.

* * *

Small Steamboats. Why Some are So Much Better than Others.—Referring to small craft in particular (25 to 150 feet) it will be found that the most successful are fitted with modern marine steam machinery built for that particular hull by some one shop.

The builder of the complete machinery "outfit" (making it all and not sub-letting parts of the job to various shops) furnishes the boat builder with reliable details as to weights, and scale drawings showing dimensions and arrangement of the important parts, on what amounts to the same basis, that is the rule in constructing large vessels, all of which is instrumental in producing a perfect craft. Thus the various parts, connections and fittings are suited to each other, and to the hull, all in exact proportion to the power, steam pressure, strain and maximum work which the boat may be called upon to perform.

Even boat builders and engineers of experience would, on investigation, be surprised to learn how few concerns there are who actually build the "complete outfit;" many sub-letting the work among different shops.

For the entire district tributary to Chicago, including the Mississippi Valley, there is but one company (Marine Iron Works, Chicago) who build all of the described machinery outfit, and making it their exclusive specialty, fully cover the line referred to, in propeller and paddle wheel machinery, condensing or non-condensing, as may be needed.

In the work described, the demand is so limited from any one district, that those giving it their entire attention, as is the case with the company named, must reach to distant points in order to justify the outlay required for facilities, patterns and equipment that are needed to keep pace with the varying requirements. It is manifest that each job has to be built to order to meet such needs, and that the designer and builder of the machinery outfit, be experienced in the construction and operation of steam craft.

The Military Service Institution.

President.

Major-General NELSON A. MILES, U. S. Army.

Resident Vice-Presidents.

Major-General THOMAS H. RUGER, U. S. A.

Bvt. Brig.-Gen. T. F. RODENBROUGH, U. S. A.

Secretary.

Capt. JAMES FORNANCE, 13th U. S. Infantry.

Treasurer.

Lieut. J. C. BUSH, 3th U. S. Artillery.

Asst. Secretary.

Lieut. H. L. HARRIS, 1st U. S. Artillery.

Vice-Treasurer.

Lieut. F. W. FUGER, 13th U. S. Infantry.

Executive Council.

Term ending 1903.

BRECK, S., Col., Adjt.-Gen'l's Dept., B. G.
CAREY, A. B., Lieut.-Col. Pay Dept.
EDMONDS, F. H., Capt. 1st U. S. Infantry
FIEBERGER, G. J., Prof. U. S. Mil. Academy.
HUGHES, R. P., Colonel, Insp.-General.
WOODRUFF, C. A., Major, Sub. Dept.

Term ending 1901.

BARR, T. F., Colonel A. J. A. G.
BREWERTON, H. F., Major U. S. A.
KNIGHT, J. G. D., Major Corps Engineers.
MILLER, S. C., Capt. 13th U. S. Infantry, A. D. C.
MYRICK, J. R., Major 5th U. S. Artillery.
(Vacancy.)

Term ending 1899.

Finance Committee.

Col. BARR.
Col. CAREY.
Major WOODRUFF.

KIMBALL, J. P., Major Med. Dept.
PARKER, JAMES, Capt. 4th U. S. Cavalry.
PATTEN, W. S., Major Q. M. Dept.
PHIPPS, F. H., Major Ordnance Dept.
WARD, THOS., Lieut.-Col., Adjt. Gen'l's Dept.
WEBB, A. S., Bvt. Major-General (late) U. S. A.

Library Committee.

(Vacancy.)

Publication Committee.

General BRECK, Capt. EDMONDS, and Lieut. BUSH.

Branches.

(In the order of their establishment.)

Vancouver Barracks, Wash.

Vice-President.

Brig.-General E. S. OTIS, U. S. A.

Corresponding Secretary.

Lieut. H. P. MCCAIN, 14th U. S. Infantry.

West Point, N. Y.

Vice-President.

Col. O. H. ERNST, Corps of Engineers.

Corresponding Secretary.

Lieut. EDGAR RUSSELL, 5th U. S. Artillery.

Fort Leavenworth, Kansas.

Vice-President.

Col. H. S. HAWKINS, 20th U. S. Infantry.

Corresponding Secretary.

Lieut. R. G. HILL, 20th U. S. Infantry.

Membership dates from the first day of the calendar year in which the "application" is made, unless such application is made after October 1st, when the membership dates from the first day of the next calendar year.

"An Entrance Fee of Five Dollars (\$5) shall be paid by each Member and Associate Member on joining the Institution, which sum shall be in lieu of the dues for the first year of membership and on the first day of each calendar year, thereafter, a sum of not less than Two Dollars (\$2) shall be paid as annual dues. Annual dues commence on January 1st in each year."

NOTE.—Checks and Money Orders should be drawn to order of, and addressed to, "The Treasurer Military Service Institution," Governor's Island, New York Harbor. Yearly dues (\$2.00) include Journal.

Changes of address should be reported promptly.



Prize Essay—1897.

I.—The following Resolution of Council is published for the information of all concerned :

Resolved, That a Prize of a Gold Medal, together with \$100 and a Certificate of Life Membership, be offered annually by THE MILITARY SERVICE INSTITUTION OF THE UNITED STATES for the best essay on a military topic of current interest, the subject to be selected by the Executive Council, and \$50 to the first honorably mentioned essay. The Prizes will be awarded under the following conditions :

1. Competition to be open to all persons eligible to membership.
2. Each competitor shall send three copies of his Essay in a sealed envelope to the Secretary *on or before September 1, 1897*. The Essay must be strictly anonymous, but the author shall adopt some *nom de plume* and sign the same to the Essay, followed by a figure corresponding with the number of pages of MS.; a sealed envelope bearing the *nom de plume* on the outside, and enclosing full name and address, should accompany the Essay. This envelope to be opened in the presence of the Council after the decision of the Board of Award has been received.
3. The prize shall be awarded upon the recommendation of a Board consisting of three suitable persons chosen by the Executive Council, who will be requested to designate *the Essay deemed worthy of the prize*; and also in their order of merit those deserving of honorable mention.

In determining the essay worthy of the prize, the Board will be requested to consider its professional excellence, usefulness and valuable originality, as of the first importance, and its literary merit as of the second importance. Should members of the Board determine that no essay is worthy of the prize, they may designate one or more essays simply as of honorable mention ; in either case, they will be requested to designate one essay as first honorable mention. Should the Board deem proper, it may commend neither prize nor honorable mention. Should it be so desired, the recommendation of individual members will be considered as confidential by the Council.

4. The successful Essay shall be published in the Journal of the Institution, and the Essays deemed worthy of honorable mention shall be read before the Institution, or published, at the discretion of the Council.

5. Essays must not exceed twenty thousand words, or fifty pages of the size and style of the JOURNAL (exclusive of tables).

II.—The Subject selected by the Council at a meeting held Sept. 11, 1896, for the Prize Essay of 1897, is

"BASED ON PRESENT CONDITIONS AND PAST EXPERIENCES, HOW SHOULD OUR VOLUNTEER ARMIES BE RAISED, ORGANIZED, TRAINED AND MOBILIZED FOR FUTURE WARS."

III.—The gentlemen chosen by the Council to constitute the Board of Awards for the year 1897 are :

GENERAL WESLEY MERRITT,
GOVERNOR U. A. WOODBURY,
COLONEL H. W. CLOSSON.

JAMES FORNANCE,
Secretary.

GOVERNOR'S ISLAND,
Nov. 1, 1896.